



# Oregon State University

## INVITATION TO BID #199306

### DIXON RECREATION RENOVATION – RE-BID

ISSUE DATE: May 7, 2019

ITB CLOSING (DUE) DATE: May 29, 2019, 2019  
at 2:00 PM Pacific Time

**\*OFFICE IS CLOSED DAILY FROM NOON TO 1:00  
PM**

MANDATORY PRE-BID CONFERENCE: May 13,  
2019 at 11:00 AM Pacific Time in the Main  
Lobby of Dixon Recreation Center at 425 SW  
26<sup>th</sup> Street, Corvallis, OR 97331.

QUESTION DEADLINE: May 22, 2019 at 5:00 PM Pacific Time

PROJECT NUMBER: 2066-18

#### CONTRACT ADMINISTRATOR:

**Matt Hausman, Construction Contract Officer**  
Construction Contract Administration  
Oregon State University  
644 SW 13<sup>th</sup> Ave.  
Corvallis, OR 97333  
Phone: (541) 737-3401  
FAX: (541) 737-5546  
Email: [matt.hausman@oregonstate.edu](mailto:matt.hausman@oregonstate.edu)

#### AWARD DECISION APPEALS:

**Hanna Emerson, Construction Contracts  
Manager**  
Construction Contract Administration  
Oregon State University  
644 SW 13<sup>th</sup> Ave.  
Corvallis, OR 97333  
Phone: (541) 737-7342  
FAX: (541) 737-5546  
Email: [hanna.emerson@oregonstate.edu](mailto:hanna.emerson@oregonstate.edu)

It is the Bidder's responsibility to continue to monitor the [OSU Business and Bid Opportunities](#) website for Addenda. Failure to acknowledge any Addenda in the Bid Form may cause your Bid to be considered non-responsive.

*OSU standards and policies govern this solicitation ([Procurement Thresholds and Methods, Procurement Solicitations and Contracts](#)) unless otherwise referenced or stated.*

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***Prepared by Woofter Architecture dated April, 2019***

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***Prepared by Woofter Architecture dated April 17, 2019. Available for Download at the following link:***  
***<https://oregonstate.box.com/s/l2hngejb2iea7u4a1rvudifb6jv0zh0c>***

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## **INSTRUCTIONS TO BIDDERS**

OSU Policies and Standards ([Procurement Thresholds and Methods, Procurement Solicitations and Contracts](#)) govern this OSU procurement process.

### **Article 1. Definitions**

**1.1.** Capitalized words used herein but not defined shall have the meaning set forth in the OSU General Conditions and OSU Policies and Standards. The following terms used herein shall have the meaning set forth below:

“**Bid Form**”- refers to OSU form provided by Owner to be completed by Bidder.

“**Project Manual**”- The Project Manual includes, but is not necessarily limited to, the following: the Advertisement for Bids or Notice of Contracting Opportunity, these Instructions to Bidders, Supplemental Instructions to Bidders, Bid Form, Bid Bond, OSU General Conditions, Supplemental General Conditions (if any), Sample Supplement or Agreement, Performance Bond, Payment Bond, and the Plans and Specifications.

### **Article 2. Scope of Work**

**2.1** The Work contemplated in this document shall be for the Owner in connection with the Project described in the Project Manual.

### **Article 3. Examination of Site and Conditions**

**3.1** Before making a Bid, the Bidder shall examine the Work site to ascertain its physical condition. The Bidder shall be responsible for being fully informed as to the quality, quantity and sources of supply of the materials listed on the Project Manual. Failure to comply with this Section will not release Contractor from entering into the Contract nor excuse Contractor from performing the Work in strict accordance with the terms of the Contract Documents.

**3.2** The Owner will not be responsible for any loss or unanticipated costs which may arise as a result of Contractor's failure to be fully informed in advance with regard to all conditions pertaining to the Work and the character of the Work required.

**3.3.** No statement made by any officer, agent, or employee of the Owner in relation to the physical conditions pertaining to the Work site or quality, quantity, and supply of materials will be binding on the Owner, unless included in writing in the Project Manual or an Addendum.

### **Article 4. Substitute Materials Approval Process**

**4.1** Prior to submitting a Bid including a Substitution, the Bidder must first seek approval of the Substitution from the Architect (or Engineer, as appropriate hereafter) by submitting a written request for approval at least 10 calendar days prior to the Closing Date and Time. The Bidder submitting the request shall be responsible for its timely delivery.

**4.2** Substitution approval requests shall be accompanied by samples, records of performance, certified copies of tests by impartial and recognized laboratories, and such other information as the Architect may request.

**4.3** Within a reasonable time after receiving such a request the Owner (or Architect if so designated) will consider whether the Substitution sought by Bidder is of equal value, utility, as the designated product in the Project Manual.

If the requested Substitution is approved an Addendum to the Project Manual shall be issued. A copy of each Addendum shall become a part of the Project Manual.

**4.4** When the Architect approves a Substitution by Addendum, it is with the understanding that the Contractor guarantees the substituted article or material to be equal or better than the one specified.

## **Article 5. Interpretation of Project Manual**

**5.1** A Bidder in doubt as to the meaning of any part of the Project Manual may submit a written request for an interpretation to the Architect at any time prior to 10 calendar days prior to the Closing Date and Time.

**5.2** Any interpretation of the Project Manual will be made only by a duly issued Addendum. The Owner will not be responsible for any other explanation or interpretation of the Project Manual nor for any other approval of a particular manufacturer's process or item.

**5.3** To establish a basis of quality, certain processes, types of machinery and equipment or kinds of materials may be specified in the Project Manual either by description of process or by designating a manufacturer by name and referring to a brand or product designation or by specifying a kind of material. Whenever a process is designated or a manufacturer named, brand or item designation given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved equal" follow such name, designation or description, whether they do so or not.

## **Article 6. Execution of the Bid Form**

**6.1** The Bid Form relates to Bids on a specific Project Manual. Only the amounts and information asked for on the Bid Form furnished by the Owner will be considered as the Bid. Each Bidder shall Bid upon the Work exactly as set forth in the Bid Form. The Bidder shall include in the Bid a sum to cover the cost of all items contemplated by the Project Manual. Bids that fail to address alternates set forth on the Bid Form may be considered non-responsive.

**6.2** Each Bid Form must: 1) Be completed in accordance with these instructions; 2) Include the appropriate signatures as noted on the Bid Form; 3) Include numbers pertaining to base Bids stated both in writing and in figures; and 4) Include the Bidder's typed or clearly printed address.

**6.3** When Bidding on an alternate for which there is no charge, the Bidder shall write the words "No Charge" in the space provided on the Bid Form. If one or more alternates is shown on the Bid Form, the Bidder shall indicate whether each is "add" or "deduct."

## **Article 7. Prohibition of Alterations to Bid**

**7.1** Bids which are incomplete, or contain ambiguities or conditions not provided for in the Bid Form, may be rejected.

## **Article 8. Submission of Bid**

**8.1** Each Bid shall be sealed in an envelope, properly addressed to the appropriate project representative of the Owner, showing on the outside of the envelope the name of the Bidder and the name of the project. Bids will be received at the time and place stated in the Advertisement for Bids.

## **Article 9. Bid Closing and Opening of Bids**

**9.1** All Bids must be received by the Owner before the Closing Date and Time. Any Bids received after the Closing

Date and Time will be rejected and returned to the Bidder unopened.

9.2 At the time of opening and reading of Bids, each Bid received, irrespective of any irregularities or informalities, will be publicly opened and read aloud.

#### **Article 10. Acceptance or Rejection of Bids by Owner**

10.1 Unless all Bids are rejected, the Owner will award the Contract based on the lowest responsive Bid from a responsible Bidder. If that Bidder does not execute the Contract, the Contract will be awarded to the next lowest responsible Bidder or Bidders in succession.

10.2 The procedures for Contract awards shall be in compliance with the provisions of OSU Standards adopted by the Owner.

10.3 The Owner reserves the right to reject all Bids and to waive minor informalities.

10.4 The Owner reserves the right to hold the Bid and any required Bid security, of the three lowest Bidders for a period of 30 calendar days from the time of Bid opening pending award of the Contract. Following award of the Contract, any Bid security furnished by the three lowest Bidders may be held 20 calendar days pending execution of the Contract. All other Bids will be rejected and Bid security returned.

10.5 In determining the lowest Bidder, the Owner reserves the right to take into consideration any or all authorized base Bids as well as alternates or combinations indicated in the Bid Form.

10.6 If Owner has not accepted a Bid within 30 calendar days after the opening of the Bids, each of the three lowest Bidders may withdraw the Bid submitted and request the return of any Bid security then held.

#### **Article 11. Withdrawal of Bid**

11.1 At any time prior to the Closing Date and Time a Bidder may withdraw its Bid. This will not preclude the submission of another Bid by such Bidder prior to the Closing Date and Time.

11.2 After the Closing Date and Time, no Bidder will be permitted to withdraw its Bid within the time period specified in Article 10 for award and execution, except as provided for in that Article.

#### **Article 12. Execution of Contract, Agreement, Performance Bond and Payment Bond**

12.1 The Owner will provide the successful Bidder with Contract Documents within 10 calendar days after the award of the Contract. The Bidder shall be required to execute the Contract as provided, including a Performance Bond and a Payment Bond from a surety company licensed to do surety business in the State of Oregon, within 20 calendar days after the award of the Contract. The Contract Documents shall be delivered to the Owner in the manner stated in the Notice of Award.

#### **Article 13. Recyclable Products**

13.1 Contractors must use recyclable products to the maximum extent economically feasible in the performance of the Contract.

OREGON STATE UNIVERSITY

BID FORM

PROJECT: DIXON RECREATION RENOVATION - REBID

BID DUE DATE/TIME: MAY 29, 2019 AT 2:00 PM PACIFIC TIME

FROM: \_\_\_\_\_
Name of Contractor

TO: Oregon State University ("Owner")
Construction Contract Administration
3015 SW Western Blvd.
Corvallis, Oregon 97333

1. The Undersigned (check one of the following and insert information requested):

- a. An individual doing business under an assumed name registered under the laws of the State of \_\_\_\_\_; or
b. A partnership registered under the laws of the State of \_\_\_\_\_; or
c. A corporation organized under the laws of the State of \_\_\_\_\_; or
d. A limited liability corporation/company organized under the laws of the State of \_\_\_\_\_;

hereby proposes to furnish all material and labor and perform all work hereinafter indicated for the above project in strict accordance with the Contract Documents for the Base Bid as follows:

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

and the Undersigned agrees to be bound by the following documents:

- Notice of Opportunity
• Supplemental Instructions to Bidders
• Performance Bond and Payment Bond
• Supplemental OSU General Conditions
• Prevailing Wage Rates
• Plans and Specifications
• Instructions to Bidders
• Sample Contract
• OSU General Conditions
• Payroll and Certified Statement Form
• Drawings and Details
• ADDENDA numbered \_\_\_\_ through \_\_\_\_, inclusive (fill in blanks)

2. The Undersigned proposes to add to or deduct from the Base Bid indicated above the items of work relating to the following Alternate(s) as designated in the Specifications:

ALTERNATE 1: CASEWORK IN MULTI-EXERCISE ROOMS 126, 130, AND 132
BASE BID: Provide casework, bench, cabinets, and coat hooks as shown in documents.
DEDUCTIVE ALTERNATE: Provide no casework bench, cabinets, and coat hooks at entry of Multi-Exercise 126, 130, and 132. Provide Wall Type N-W1.6.B.A. from Level 1 to Level 2 in location where casework is indicated. Provide RB-1 at wall base. Paint walls PT-2.

ADD/DEDUCT: \$ \_\_\_\_\_

\_\_\_\_\_

ALTERNATE 2: OPENING BETWEEN MULTI-EXERCISE 130 AND MULTI-EXERCISE 132  
BASE BID: Provide opening between Multi-Exercise 130 and Multi-Exercise 132 as indicated in drawings.  
DEDUCTIVE ALTERNATE: Provide no new opening between Multi-Exercise Rooms 130 and 132.  
Eliminate all scope of work associated with opening including saw cutting of existing CMU wall,  
fabrication and installation of steel support structure, and fabrication and installation of architectural trim.  
Install wall finishes to match adjacent wall including AWP and MDF panels. Install L11 light fixture  
continually on wall per adjacent wall details.

ADD/DEDUCT: \$ \_\_\_\_\_

3. The work shall be completed within the time stipulated and specified in Division 1, Section 01 11 00, of the Specifications.

4. The Undersigned certifies that: (1) This Bid has been arrived at independently and is being submitted without collusion with and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment or services described in the invitation to bid designed to limit independent bidding or competition; and (2) The contents of the Bid have not been communicated by the Undersigned or its employees or agents to any person not an employee or agent of the Undersigned or its surety on any Bond furnished with the Bid and will not be communicated to such person prior to the official opening of the Bid.

5. The undersigned **HAS, HAS NOT** (*circle applicable status*) paid unemployment or income taxes in Oregon within the past 12 months and **HAS, HAS NOT** (*circle applicable status*) a business address in Oregon.

6. The Undersigned agrees, if awarded a contract, to comply with the provisions of ORS 279C.800 through 279C.870 pertaining to the payment of the prevailing rates of wage.

7. Contractor's CCB registration number is \_\_\_\_\_. As a condition to submitting a bid, a Contractor must be registered with the Oregon Construction Contractors Board in accordance with ORS 701.035 to 701.055, and disclose the registration number. Failure to register and disclose the number will render the bid unresponsive and it will be rejected, unless contrary to federal law.

8. The successful Bidder hereby certifies that all subcontractors who will perform construction work as described in ORS 701.005(2) were registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time the subcontractor(s) made a bid to work under the Contract.

9. The successful Bidder hereby certifies that, in compliance with the Worker's Compensation Law of the State of Oregon, its Worker's Compensation Insurance provider is \_\_\_\_\_, Policy No. \_\_\_\_\_, and that Contractor shall submit Certificates of Insurance as required.

10. Contractor's Project Manager for this project is: \_\_\_\_\_,  
Office Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_.

11. The Undersigned certifies that it has not discriminated against minority, women, or emerging small businesses in obtaining any subcontracts for this project.

12. The Undersigned agrees, if awarded the Contract, to execute and deliver to Owner, within twenty (20) calendar days after receiving the Contract Documents, an Agreement Form and a satisfactory Performance Bond and Payment Bond, each in an amount equal to one hundred (100) percent of the Contract sum, using forms provided by the Owner. The surety requested to issue the Performance Bond and Payment Bond will be: \_\_\_\_\_.

(name of surety company - not insurance agency) The  
Undersigned hereby authorizes said surety company to disclose any information to the Owner concerning  
the Undersigned's ability to supply a Performance Bond and Payment Bond each in the amount of the  
Contract.

By signature below, Contractor agrees to be bound by this Bid.

NAME OF FIRM \_\_\_\_\_

ADDRESS \_\_\_\_\_

\_\_\_\_\_

FEDERAL TAX ID \_\_\_\_\_

TELEPHONE NO \_\_\_\_\_

FAX NO \_\_\_\_\_

SIGNATURE 1) \_\_\_\_\_

Sole Individual - Signature

\_\_\_\_\_

Sole Individual - Printed Name

or 2) \_\_\_\_\_

Partner

or 3) \_\_\_\_\_

Authorized Officer of Corporation - Signature

\_\_\_\_\_

Authorized Officer of Corporation Printed Name

(SEAL)

\_\_\_\_\_

Attested: Secretary of Corporation

*Payment information will be reported to the IRS under the name and taxpayer ID # provided above.  
Information not matching IRS records could subject Contractor to 31 percent backup withholding.*

**\*\*\*\*\* END OF BID \*\*\*\*\***



**OSU RESERVE CONTRACT SUPPLEMENT  
OSU RESERVE CONTRACT FOR CONSTRUCTION  
RELATED SERVICES  
SUPPLEMENT NO.: OSU-xxx-C-18-xx  
PROJECT NAME**

This OSU Reserve Contract Supplement dated XXXX (the "Supplement") is entered into between:

"Contractor":

and "Owner": Oregon State University  
Construction Contract Administration  
644 SW 13<sup>th</sup> Ave  
Corvallis, OR 97333

(collectively the "Parties") pursuant to the OSU Reserve Contract for Construction Related Services between the Parties (the "Reserve Contract"). Capitalized terms have the meaning defined in the General Conditions unless otherwise defined in the Reserve Contract or herein.

**1. DESCRIPTION OF THE PROJECT.** The project to which this Supplement pertains is described as follows: (the "Project").

**2. WORK TO BE PERFORMED.** Contractor shall perform the following work on the Project: (the "Work"). Contractor will perform the Work according to the terms and conditions of this Supplement and the Contract Documents, which are incorporated herein by this reference.

**3. SCHEDULE.** Contractor shall perform the Work according to the following schedule: (the "Schedule").

**4. COMPENSATION.** Owner shall compensate Contractor for Work in the firm, fixed-price amount of \$XXX.XX in accordance with the requirements of the General Conditions.

The cost of the Work under this Supplement, even if this Supplement is later amended to include additional work, must not exceed the greater of \$2,000,000 or the maximum allowable under OSU standards and policies.

**5. TERM.** This Supplement is effective on the date it has been signed by every Party hereto (the "Supplement Effective Date"). No Work shall be performed or payment made prior to the Supplement Effective Date. Contractor shall perform its obligations in accordance with the Contract Documents, unless this Supplement is earlier terminated or suspended.

Contractor hereby agrees that the Work set forth in this Supplement may continue beyond the Term of the Reserve Contract and will be performed through final completion of Contractor's Work, including completion of all warranty work. The Parties expressly agree that they may execute a Supplement Amendment and extend the date which Contractor's Work may be completed, which may include a date beyond the Term of the Reserve Contract.

Termination or suspension does not extinguish or prejudice Owner's right to enforce the Supplement with respect to any breach by the Contractor that has not been cured.

**6. PERFORMANCE AND PAYMENT BONDS.** The performance and payment bond requirements for this Project are as follows (check one of the following):

As a condition precedent to the effectiveness of this Supplement and to Owner's obligation to make payment for the Work, Contractor shall provide the Owner with a performance bond and a separate payment bond in a sum equal to the Contract Price stated in Section 4 of this Supplement.

This Project has a Contract price of \$150,000 or less, and Owner has determined that performance and payment bonds will not be required for this Project.

**7. PREVAILING WAGE RATES.**

Prevailing Wage Rates requirements apply to this Project. Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates and the required public works bond, as outlined in Sections C.1, C.2 and G.2.3 of the General Conditions. The Bureau of Labor and Industries (BOLI) wage rates and requirements set forth in the following BOLI booklet (and any listed amendments to that booklet), which are incorporated herein by reference, apply to the Work authorized under this Supplement:

**PREVAILING WAGE RATES for Public Works Contracts in Oregon, XXXX, as amended XXXX, which can be downloaded at the following web address:**

[[http://www.boli.state.or.us/BOLI/WHD/PWR/pwr\\_book.shtml](http://www.boli.state.or.us/BOLI/WHD/PWR/pwr_book.shtml)]

The Work will take place in XXX County, Oregon.

**8. INSURANCE REQUIREMENTS.**

Contractor shall comply with and obtain the insurance coverage amounts stated in the General Conditions.

The Owner has determined that the Contractor shall obtain insurance in the amount described in the Supplemental General Conditions, attached hereto.

**9. OTHER TERMS.** Except as specifically modified by this Supplement, all terms of the Reserve Contract remain unchanged.

**10. EXECUTION AND COUNTERPARTS.** This Supplement may be executed in several counterparts, each of which shall be an original, all of which shall constitute but one and the same instrument.

**Contractor hereby confirms and certifies that the representations, warranties, and certifications contained in the Reserve Contract remain true and correct as of this Supplement Effective Date.**

IN WITNESS HEREOF, the Parties have duly executed this Supplement as of the dates indicated below.

, Contractor

Oregon State University, Owner

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

Print Name: Anita Nina Azarenko

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

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

Title: Associate Vice President for  
University Facilities, Infrastructure and  
Operations

Date: \_\_\_\_\_

Date: \_\_\_\_\_

SAMPLE

**OREGON STATE UNIVERSITY**

**PERFORMANCE BOND**

Bond No. \_\_\_\_\_  
Solicitation \_\_\_\_\_  
Project Name \_\_\_\_\_

\_\_\_\_\_ (Surety #1)                      Bond Amount No. 1:                      \$ \_\_\_\_\_  
\_\_\_\_\_ (Surety #2)\*                      Bond Amount No. 2: \*                      \$ \_\_\_\_\_  
*\* If using multiple sureties*                      Total Penal Sum of Bond:                      \$ \_\_\_\_\_

We, \_\_\_\_\_ as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Oregon State University (OSU), the sum of (Total Penal Sum of Bond)

\_\_\_\_\_  
(Provided, that we the Sureties bind ourselves in such sum “jointly and severally” as well as “severally” only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into contract No. \_\_\_\_\_ with the OSU, the plans, specifications, terms and conditions of which are contained within the Contract resulting from the above-referenced Solicitation;

WHEREAS, the terms and conditions of the Contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of Contract prices, are made a part of this Performance Bond by reference, whether or not attached to the contract (all hereafter called “Contract”); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and all authorized modifications of the Contract which increase the amount of the work, the amount of the Contract, or constitute an authorized extension of the time for performance, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein shall (1) faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, (2) shall well and truly and fully do and perform all matters and things undertaken by Contractor to be performed under the Contract, upon the terms set forth therein, and within the time prescribed therein, or as extended as provided in the Contract, with or without notice to the Sureties, (3) shall save, defend, indemnify and hold harmless OSU and its officers, board members, employees, agents and other representatives, against any direct or indirect damages or claim of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by

the Principal or its subcontractors, and (4) shall in all respects perform said contract according to law, then this obligation is to be void; otherwise, it shall remain in full force and effect.

Nonpayment of the bond premium will not invalidate this bond, nor shall OSU be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapters 279C and 352, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**PRINCIPAL:** \_\_\_\_\_

By \_\_\_\_\_

Signature

\_\_\_\_\_  
Official Capacity

Attest: \_\_\_\_\_

Corporation Secretary

**SURETY:** \_\_\_\_\_

*[Add signatures for each surety if using multiple bonds]*

**BY ATTORNEY-IN-FACT:**

*[Power-of-Attorney must accompany each surety bond]*

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Address

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip

\_\_\_\_\_  
Phone

\_\_\_\_\_  
Fax

**OREGON STATE UNIVERSITY**

**PAYMENT BOND**

Bond No. \_\_\_\_\_  
Solicitation \_\_\_\_\_  
Project Name \_\_\_\_\_

\_\_\_\_\_ (Surety #1)                      Bond Amount No. 1:                      \$ \_\_\_\_\_  
\_\_\_\_\_ (Surety #2)\*                      Bond Amount No. 2:\*                      \$ \_\_\_\_\_  
\* *If using multiple sureties*                      Total Penal Sum of Bond:                      \$ \_\_\_\_\_

We, \_\_\_\_\_, as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Oregon State University (OSU) the sum of (Total Penal Sum of Bond) \_\_\_\_\_ (Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into contract No. \_\_\_\_\_ with OSU, the plans, specifications, terms and conditions of which are contained within the Contract resulting from the above-referenced Solicitation;

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Payment Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and schedule of contract prices which are set forth in the Contract and any attachments, and all authorized modifications of the Contract which increase the amount of the work, or the cost of the Contract, or constitute authorized extensions of time for performance of the Contract, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall (1) faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, (2) shall well and truly and fully do and perform all matters and things by it undertaken to be performed under said Contract and any duly authorized modifications that are made, upon the terms set forth therein, and within the time prescribed therein, or as extended therein as provided in the Contract, with or without notice to the Sureties, (3) shall save, defend, indemnify and hold harmless OSU, and its officers, board members, employees, agents and other representatives, against any claim for direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Contractor or its subcontractors, (4) shall promptly pay all persons supplying labor, materials or both to the Principal or its subcontractors for prosecution of the work provided in the Contract; (5) shall promptly pay all contributions due the State Industrial Accident Fund and the State Unemployment Compensation Fund from the Principal or its

subcontractors in connection with the performance of the Contract; (6) shall pay over to the Oregon Department of Revenue all sums required to be deducted and retained from the wages of employees of the Principal and its subcontractors pursuant to ORS 316.167;(7) shall permit no lien nor claim to be filed or prosecuted against the State or OSU on account of any labor or materials furnished; and (8) shall do all things required of the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect.

Nonpayment of the bond premium will not invalidate this bond, nor shall OSU be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapters 279C and 352, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES:

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**PRINCIPAL:** \_\_\_\_\_

By \_\_\_\_\_  
Signature

\_\_\_\_\_  
Official Capacity

Attest: \_\_\_\_\_  
Corporation Secretary

**SURETY:** \_\_\_\_\_

*[Add signatures for each if using multiple bonds]*

**BY ATTORNEY-IN-FACT:**

*[Power-of-Attorney must accompany each bond]*

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Address

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
Phone Fax

# OREGON STATE UNIVERSITY GENERAL CONDITIONS FOR RESERVE CONTRACTS

January 31, 2019

INSTRUCTIONS: The attached **Oregon State University General Conditions for Reserve Contracts ("General Conditions")** apply to all designated Reserve Contracts. Changes to the General Conditions (including any additions, deletions or substitutions) should only be made by attaching Supplemental General Conditions. The text of these General Conditions should not otherwise be altered.

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**OREGON STATE UNIVERSITY  
GENERAL CONDITIONS FOR RESERVE CONTRACTS  
("General Conditions")**

**SECTION A  
GENERAL PROVISIONS**

**A.1 DEFINITION OF TERMS**

In the Contract Documents, the following terms shall be as defined below:

**AMENDMENT**, means a writing which, when fully executed by the Parties to this Contract, constitutes a change to a Contract Document. Amendments to Supplements (hereinafter a "Supplement Amendment") shall be issued in accordance with the changes provisions of Section D and, if applicable, establish a Contract Price or Contract Time adjustment.

**APPLICABLE LAWS**, means federal, state and local laws, codes, rules, regulations and ordinances applicable to the Work and to the Contract.

**ARCHITECT/ENGINEER**, means the Person appointed by the Owner to make drawings and specifications and, to provide contract administration of the Work contemplated by the Contract to the extent provided herein or by supplemental instruction of Owner (under which Owner may delegate responsibilities to the Architect/Engineer), in accordance with ORS Chapter 671 (Architects) or ORS Chapter 672 (Engineers) and administrative rules adopted thereunder.

**CHANGE ORDER**, means a written order issued by the Owner to be later included as an Amendment. A Change Order shall not be effective until codified as an Amendment.

**CLAIM**, means a demand by Contractor pursuant to Section D.3 for review of the denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, submitted in accordance with the requirements and within the time limits established for review of Claims in these General Conditions.

**CONSTRUCTION CHANGE DIRECTIVE**, means a written order by the Owner to the Contractor requiring a change in the Work within the general scope of the Contract Documents, issued under the changes provisions of Section D.

**CONSTRUCTION SCHEDULE**, means the schedule prepared by the Contractor in CPM format and approved by the Owner, and all adjustments thereto approved by the Owner, that describes sequence and timing of the Work.

**CONTRACT**, means the written agreement between the Owner and the Contractor comprised of the Contract Documents which describe the Work to be done and the obligations between the parties.

**CONTRACT DOCUMENTS**, means the Reserve Contract, General Conditions, Supplemental General Conditions if any, Supplements, the accepted Offer, Plans, Specifications, Change Orders, Amendments, Construction Change Directives, Solicitation Document and addenda thereto, Instructions to Offerors, and Supplemental Instructions to Offerors, the Construction Schedule prepared and approved in accordance with the Construction Documents, and all other required Submittals.

**CONTRACT PERIOD**, as set forth in the Contract Documents, means the total period of time beginning with the full execution of a Supplement and, if applicable, the issuance of a Notice to Proceed and concluding upon Final Completion.

**CONTRACT PRICE**, means the total of the awarded Offer amount, as increased or decreased by the price of approved alternates, as indicated in the Contract Documents.

**CONTRACT TIME**, means any incremental period of time allowed under the Contract to complete any portion of the Work as reflected in the project schedule.

**CONTRACTOR**, means the Person awarded the Contract for the Work contemplated.

**CPM**, means a critical path method format to be used for the Construction Schedule.

**DAYS**, are calendar days, including weekdays, weekends and holidays, unless otherwise specified.

**DIRECT COSTS**, means, unless otherwise provided in the Contract Documents, the cost of materials, including sales tax, cost of delivery; cost of labor, including social security, Medicare and unemployment insurance, and fringe benefits required by agreement or custom; worker's compensation insurance; project specific insurance (including, without limitation, Builder's Risk Insurance and Builder's Risk Installation Floater); bond premiums, rental cost of equipment, and machinery required for execution of the Work; and the additional costs of field personnel directly attributable to the Work.

**FINAL COMPLETION**, means the final completion of all requirements under the Contract, including Contract Closeout as described in Section K but excluding Warranty Work as described in Section I.2, and the final payment and release of all retainage, if any, released.

**FINAL PAYMENT**, means the last payment to the Contractor, including retainage, in connection with the Work.

**FORCE MAJEURE**, means an act, event or occurrence caused by fire, riot, war, acts of God, nature, sovereign, or public enemy, strikes, freight embargoes or any other act, event or occurrence that is beyond the control of the party to this Contract who is asserting Force Majeure.

**MWESB REPORT**, means an accurate report by the Contractor to the Owner identifying all Minority, Women and Emerging Small Business (MWESB) enterprises, as those terms are defined in ORS 200.005, receiving contracts throughout the course of the Work. An initial MWESB report is required (see Section E.2.9) and MWESB Reports are required annually (see Section E.2.9) and as a condition of final payment (see Section K.1). The initial report shall include the total number of contracts and subcontracts awarded to MWESB enterprises and the dollar value of their respective contracts and subcontracts. The annual reports shall include the total number of contracts and subcontracts awarded to MWESB enterprises, the dollar value of each, and the expenditure toward each contract and subcontract during the previous twelve (12) months. The final report shall include the total number of contracts and subcontracts awarded to MWESB enterprises and the dollar value of their respective contracts and subcontracts including all Supplements and Amendments incorporated during the course of the project. The reports shall only include enterprises certified with the State of Oregon as MWESB enterprises and shall include individual identification of each enterprise as a Minority business enterprise, a Women business enterprise, and/or an Emerging Small Business Enterprise, as applicable.

**NOTICE TO PROCEED**, means the official written notice from the Owner stating that the Contractor is to proceed with the Work defined in the Contract Documents. Notwithstanding the Notice to Proceed, Contractor shall not be authorized to proceed with the Work until all initial Contract requirements, including the Contract, performance bond and payment bond, and certificates of insurance, have been fully executed and submitted to Owner in a suitable form.

**OFFER**, means a bid in connection with Instructions to Bidders or a proposal in connection with a Request for Proposals.

**OFFEROR**, means an entity who submits a response to a solicitation document.

**OVERHEAD**, means those items which may be included in the Contractor's markup (general and administrative expense and profit) and that shall not be charged as Direct Cost of the Work, including without limitation such Overhead expenses as wages or salary of personnel above the level of foreman (i.e., superintendents and project managers), expenses of Contractor's offices and supplies at the job site (e.g. job trailer) and at Contractor's principal place of business and including expenses of personnel staffing the job site office and Contractor's principal place of business, and Commercial General Liability Insurance and Automobile Liability Insurance.

**OWNER**, means Oregon State University (OSU). Owner may elect, by written notice to Contractor, to delegate certain duties to more than one party, including without limitation, to an Architect/Engineer. However, nothing in these General Conditions is intended to abrogate the separate design professional responsibilities of Architects under ORS Chapter 671 or of Engineers under ORS Chapter 672.

**PERSON**, means a natural person or entity doing business as a sole proprietorship, a partnership, a joint venture, a corporation, a limited liability company or partnership, or any other entity possessing the legal capacity to contract.

**PLANS**, means the drawings which show the location, type, dimensions, and details of the Work to be done under the Contract.

**PROJECT**, means the total design, development and construction of which the Work performed under the Construction Documents may be the whole or a part.

**PUNCH LIST**, means the list of Work yet to be completed or deficiencies which need to be corrected in order to achieve Final Completion of the Contract.

**RECORD DOCUMENT**, means the as-built Plans, Specifications, testing and inspection records, product data, samples, manufacturer and distributor/supplier warranties evidencing transfer of ownership to Owner, operational and maintenance manuals, shop drawings, Construction Change Directives, MWESB Reports, correspondence, certificate(s) of occupancy, and other documents listed in Subsection B.9.1 of these General Conditions, recording all Services performed.

**SUPPLEMENTAL GENERAL CONDITIONS**, means those conditions that remove from, add to, or modify these General Conditions. Supplemental General Conditions may be included in the Solicitation Document or may be a separate attachment to the Contract.

**SOLICITATION DOCUMENT**, means a document used in a formal procurement soliciting two or more qualified sources by public notice for the same specifications and requirements.

**SPECIFICATION**, means a description of the physical, functional, or performance characteristics, or of the nature of the goods, services or construction, including any requirement to be satisfied by a product, material or process indicating, if appropriate, the procedures to determine whether the requirements are satisfied. Specifications may be incorporated by reference and/or may be attached to the Contract.

**SUBCONTRACT**, means a contract between the Contractor and a subcontractor for the performance of a portion of the Work.

**SUBCONTRACTOR**, means a Person having a direct contract with the Contractor, or another Subcontractor, to perform one or more items of the Work.

**SUBSTANTIAL COMPLETION**, means the date when the Owner accepts in writing the construction, alteration or repair of the improvement to real property constituting the Work or any designated portion thereof as having reached that state of completion when it may be used or occupied for its intended purpose. Substantial Completion of facilities with operating systems occurs only after thirty (30) continuous Days of successful, trouble-free operation of the operating systems as provided in Section K.3.2.

**SUBSTITUTIONS**, means items that in function, performance, reliability, quality, and general configuration are the same or better than the product(s) specified. Approval of any substitute item shall be solely determined by the Owner. The decision of the Owner is final.

**SUPPLEMENT**, means a writing which, when fully executed by the Parties thereto, constitutes written agreement between the Owner and the Contractor comprised of the Contract Documents which describe the Work to be done and the obligations between the parties.

**WORK**, means the furnishing of all materials, equipment, labor, transportation, services and incidentals necessary to successfully complete any individual item or the entire Contract and the carrying out of duties and obligations imposed by the Contract Documents.

## **A.2 SCOPE OF WORK**

The Work contemplated under this Contract includes all labor, materials, transportation, equipment and services for, and incidental to, the completion of all construction work in connection with the project described in the Contract Documents. The Contractor shall perform all Work necessary so that the project can be legally occupied and fully used for the intended use as set forth in the Contract Documents. Execution of the Contract by the Contractor is an express representation (1) that the Contractor understands the intent stated herein with respect to the Preconstruction Phase Services, and (2) the Contractor's execution of an Amendment, including the GMP Amendment, shall be an express and unqualified representation that the Contractor understands the intent stated herein and therein.

## **A.3 INTERPRETATION OF CONTRACT DOCUMENTS**

A.3.1 Unless otherwise specifically defined in the Contract Documents, words which have well-known technical meanings or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Contract Documents are intended to be complementary. Whatever is called for in one is interpreted to be called for in all. However, in the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:

- (a) Contract Supplements, Amendments and Construction Change Directives, with those of later date having precedence over those of an earlier date;
- (b) The Supplemental General Conditions;
- (c) General Conditions;
- (d) The Reserve Contract Supplements;
- (e) Construction Change Directive;
- (f) Division One (General Requirements) of the Specifications;

- (g) Detailed Schedules of finishes, equipment and other items included in the Specifications;
- (h) Plans and Specifications (other than Division One and the Detailed Schedules to the Specifications);
- (i) Large-scale drawings on Plans;
- (j) Small-scale drawings on Plans;
- (k) Dimension numbers written on Plans which shall prevail and take precedence over dimensions scaled from Plans;
- (l) The Solicitation Document, and any addenda thereto;
- (m) The Reserve Contract.

A.3.2 In the case of an inconsistency between Plans and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Owner's interpretation in writing.

A.3.3 If the Contractor finds discrepancies in, or omissions from the Contract Documents, or if the Contractor is in doubt as to their meaning, the Contractor shall at once notify the Owner. Matters concerning and interpretation of requirements of the Contract Documents will be decided by the Owner, who may delegate that duty in some instances to the Architect/Engineer. Responses to Contractor's requests for interpretation of Contract Documents will be made in writing by Owner (or the Architect/Engineer) within any time limits agreed upon or otherwise with reasonable promptness. Interpretations and decisions of the Owner (or Architect/Engineer) will be consistent with the intent of and reasonably inferable from the Contract Documents. Contractor shall not proceed without direction in writing from the Owner (or Architect/Engineer).

A.3.4 References to standard specifications, manuals, codes of any technical society, organization or association, to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, laws or regulations in effect in the jurisdiction where the project is occurring on the first published date of the Solicitation Document, except as may be otherwise specifically stated.

**A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE**

A.4.1 It is understood that the Contractor, before submitting an Offer, has made a careful examination of the Contract Documents; has become fully informed as to the quality and quantity of materials and the character of the Work required; and has made a careful examination of the location and conditions of the Work and the sources of supply for materials. The Owner will in no case be responsible for any loss or for any unanticipated costs that may be suffered by the Contractor as a result of the Contractor's failure to acquire full information in advance in regard to all conditions pertaining to the Work. No oral agreement or conversation with any officer, agent, or personnel of the Owner, or with the Architect/Engineer either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

A.4.2 Should the Plans or Specifications fail to particularly describe the materials, kind of goods, or details of construction of any aspect of the Work, Contractor shall have the duty to make inquiry of the Owner and Architect/Engineer as to what is required prior to performance of the Work. Absent Specifications to the contrary, the materials or processes that would normally be used to produce first quality finished Work shall be considered a part of the Contract requirements.

A.4.3 Any design errors or omissions noted by the Contractor shall be reported promptly to the Owner, and confirmed in writing including without limitation, any nonconformity with Applicable Laws.

A.4.4 If the Contractor believes that adjustments to cost or Contract Time is involved because of clarifications or instructions issued by the Owner (or Architect/Engineer) in response to the Contractor's notices or requests for information, the Contractor must submit a written request to the Owner, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt by Contractor of the clarifications or instructions issued. If the Owner denies Contractor's request for additional compensation, additional Contract Time, or other relief that Contractor believes results from the clarifications or instructions, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process. If the Contractor fails to perform the obligations of Sections A.4.1 to A.4.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

**A.5 INDEPENDENT CONTRACTOR STATUS**

The service or services to be performed under this Contract are those of an independent contractor as defined in ORS 670.600. Contractor represents and warrants that it is not an officer, employee or agent of the Owner as those terms are used in ORS 30.265.

**A.6 RETIREMENT SYSTEM STATUS AND TAXES**

Contractor represents and warrants that it is not a contributing member of the Public Employees' Retirement System and will be responsible for any federal or state taxes applicable to payment received under this Contract. Contractor will not be eligible for any benefits from these Contract payments of federal Social Security, employment insurance, workers' compensation or the Public Employees' Retirement System, except as a self-employed individual. Unless the Contractor is subject to backup withholding, Owner will not withhold from such payments any amount(s) to cover Contractor's federal or state tax obligations.

**A.7 GOVERNMENT EMPLOYMENT STATUS**

A.7.1 If this payment is to be charged against federal funds, Contractor represents and warrants that it is not currently employed by the Federal Government. This does not preclude the Contractor from holding another contract with the Federal Government.

A.7.2 Contractor represents and warrants that Contractor is not an employee of the State of Oregon for purposes of performing Work under this Contract

**SECTION B  
ADMINISTRATION OF THE CONTRACT**

**B.1 OWNER'S ADMINISTRATION OF THE CONTRACT**

B.1.1 The Owner shall administer the Contract as described in the Contract Documents (1) during construction (2) until Final Payment is due and (3) during the one-year period for correction of Work. The Owner will act as provided in the Contract Documents, unless modified in writing in accordance with other provisions of the Contract. In performing these tasks, the Owner may rely on the Architect/Engineer or other consultants to perform some or all of these tasks.

B.1.2 The Owner will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and

quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. The Owner will not make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Owner will neither have control over or charge of, nor be responsible for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work. Inspection of the progress, quantity, or quality of the Work done by the Owner, any Owner representative, and public agency, the Architect/Engineer, or any inspector, shall not relieve the Contractor of any responsibility for the compliance of all Work with the Contract Documents.

- B.1.3 Except as otherwise provided in the Contract Documents or when direct communications have been specifically authorized, the Owner and Contractor shall communicate with each other about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.
- B.1.4 Based upon the Architect/Engineer's evaluations of the Contractor's Application for Payment, or unless otherwise stipulated by the Owner, the Architect/Engineer will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

#### **B.2 CONTRACTOR'S MEANS AND METHODS; MITIGATION OF IMPACTS**

- B.2.1 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.
- B.2.2 The Contractor is responsible to protect and maintain the Work during the course of construction and to mitigate any adverse impacts to the project, including those caused by authorized changes, which may affect cost, schedule, or quality.
- B.2.3 The Contractor is responsible for the actions of all its personnel, laborers, suppliers, and Subcontractors on the project. The Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of persons who are unfit or unskilled for the tasks assigned to them.

#### **B.3 MATERIALS AND WORKMANSHIP**

- B.3.1 The intent of the Contract Documents is to provide for the construction and completion in every detail of the Work described. All Work shall be performed in a professional manner and unless the means or methods of performing a task are specified elsewhere in the Contract Documents, Contractor shall employ methods that are generally accepted and used by the industry, in accordance with industry standards.

B.3.2 The Contractor is responsible to perform the Work as required by the Contract Documents. Defective Work shall be corrected at the Contractor's expense.

B.3.3 Work done and materials furnished shall be subject to inspection and/or observation and testing by the Owner to determine if they conform to the Contract Documents. Inspection of the Work by the Owner does not relieve the Contractor of responsibility for the Work in accordance with the Contract Documents.

B.3.4 Contractor shall furnish adequate facilities, as required, for the Owner to have safe access to the Work including without limitation walkways, railings, ladders, tunnels, and platforms. Producers, suppliers, and fabricators shall also provide proper facilities and access to their facilities.

B.3.5 The Contractor shall furnish Samples of materials for testing by the Owner and include the cost of the Samples in the Contract Price.

#### **B.4 PERMITS**

Contractor shall obtain and pay for all necessary permits and licenses, except for those specifically excluded in the Supplemental General Conditions, for the construction of the Work, for temporary obstructions, enclosures, opening of streets for pipes, walls, utilities, environmental Work, etc., as required for the Project. Owner shall obtain and pay for the general building permit and pay for any specialty permits required for the Work. Contractor shall be responsible for all violations of the law, in connection with the construction or caused by obstructing streets, sidewalks or otherwise. Contractor shall give all requisite notices to public authorities. The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of any patent or other proprietary rights and save harmless and blameless from loss, on account thereof, Oregon State University, and its departments, divisions, members and employees.

#### **B.5 COMPLIANCE WITH GOVERNMENT REGULATIONS**

B.5.1 Contractor shall comply with Applicable Laws pertaining to the Work and the Contract. Failure to comply with such requirements shall constitute a breach of Contract and shall be grounds for Contract termination. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following, as applicable: (i) Title VI and VII of Civil Rights Act of 1964, as amended; (ii) Section 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Health Insurance Portability and Accountability Act of 1996; (iv) the Americans with Disabilities Act of 1990, as amended; (v) ORS Chapters 659 and 659A; as amended; (vi) all regulations and administrative rules established pursuant to the foregoing laws; and (vii) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations.

B.5.2 Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations, and

- (a) Contractor shall not discriminate against Disadvantaged, Minority, Women or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, or a business enterprise that is owned or controlled by or that employs a disabled veteran, as that term is defined in ORS 408.225, in the awarding of subcontracts.
- (b) Contractor shall maintain, in current and valid form, all licenses and certificates required by Applicable Laws or this Contract when performing the Work.

- B.5.3 Unless contrary to federal law, Contractor shall certify that it shall not accept a bid from Subcontractors to perform Work as described in ORS 701.005 under this Contract unless such Subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.021 to 701.068 at the time they submit their bids to the Contractor.
- B.5.4 Unless contrary to federal law, Contractor shall certify that each landscape contractor, as defined in ORS 671.520(2), performing Work under this Contract holds a valid landscape contractor's license issued pursuant to ORS 671.560.
- B.5.5 The following notice is applicable to Contractors who perform excavation Work. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0100. You may obtain copies of the rules by calling the center at (503)232-1987.
- B.5.6 Failure to comply with any or all of the requirements of B.5.1 through B.5.5 shall be a breach of Contract and constitute grounds for Contract termination. Damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

## **B.6 SUPERINTENDENCE**

Contractor shall keep on the site, during the progress of the Work, a competent superintendent and any necessary assistants who shall be satisfactory to the Owner and who shall represent the Contractor on the site. Directions given to the superintendent by the Owner shall be confirmed in writing to the Contractor.

## **B.7 INSPECTION**

- B.7.1 Owner shall have access to the Work at all times.
- B.7.2 Inspection of the Work will be made by the Owner at its discretion. The Owner will have authority to reject Work that does not conform to the Contract Documents. Any Work found to be not in conformance with the Contract Documents, in the discretion of the Owner, shall be removed and replaced at the Contractor's expense.
- B.7.3 Contractor shall make or obtain at the appropriate time all tests, inspections and approvals of portions of the Work required by the Contract Documents or by Applicable Laws or orders of public authorities having jurisdiction. 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. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work. The Contractor shall give the Owner timely notice of when and where tests and inspections are to be made so that the Owner may be present for such procedures. 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 Owner.
- B.7.4 As required by the Contract Documents, Work done or material used without required inspection or testing and/or without providing timely notice to the Owner may be ordered removed at the Contractor's expense.
- B.7.5 If directed to do so any time before the Work is accepted, the Contractor shall uncover portions of the completed Work for inspection. After inspection, the Contractor shall restore such portions of Work to the standard required by the Contract. If the Work uncovered is unacceptable or was done without required

testing or inspection or sufficient notice to the Owner, the uncovering and restoration shall be done at the Contractor's expense. If the Work uncovered is acceptable and was done with sufficient notice to the Owner, the uncovering and restoration will be paid for pursuant to a Supplement Amendment.

- B.7.6 If any testing or inspection reveals 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 Owner's and Architect/Engineer's services and expenses, shall be at the Contractor's expense.
- B.7.7 When the United States government participates in the cost of the Work, or the Owner has an agreement with other public or private organizations, or if any portion of the Work is being performed for a third party or in close proximity to third party facilities, representatives of these organizations shall have the right to inspect the Work affecting their interests or property. Their right to inspect shall not make them a party to the Contract and shall not interfere with the rights of the parties of the Contract. Instructions or orders of such parties shall be transmitted to the Contractor, through the Owner.

## **B.8 SEVERABILITY**

If any provision of this Contract is declared by a court to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular provision held to be invalid.

## **B.9 ACCESS TO RECORDS**

- B.9.1 Contractor shall keep, at all times on the Work site, one record copy of the complete Contract Documents, including the Plans, Specifications, Construction Change Directives and addenda, in good order and marked currently to record field changes and selections made during construction, and one record copy of Shop Drawings, Product Data, Samples and similar submittals, and shall at all times give the Owner access thereto.
- B.9.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access, for a period not less than ten (10) years, to all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract, including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Work or this Contract shall be subject to litigation, Contractor shall retain all such records until all litigation is resolved and Contractor shall continue to provide Owner and/or its agents with full access to such records until such time as all litigation is complete and all periods for appeal have expired and full and final satisfaction of any judgment, order or decree is recorded and Owner receives a record copy of documentation from Contractor.

## **B.10 WAIVER**

Failure of the Owner to enforce any provision of this Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of this Contract.

## **B.11 SUBCONTRACTS AND ASSIGNMENT**

- B.11.1 Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound by the terms and conditions of these General Conditions, and to assume toward the Contractor all of the obligations and

responsibilities which the Contractor assumes toward the Owner thereunder, unless (1) the same are clearly inapplicable to the subcontract at issue because of legal requirements or industry practices, or (2) specific exceptions are requested by Contractor and approved in writing by Owner. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with sub-subcontractors at any level.

B.11.2 At Owner's request, Contractor shall submit to Owner prior to their execution either Contractor's form of subcontract, or the subcontract to be executed with any particular Subcontractor. If Owner disapproves such form, Contractor shall not execute the form until the matters disapproved are resolved to Owner's satisfaction. Owner's review, comment upon or approval of any such form shall not relieve Contractor of its obligations under this Agreement or be deemed a waiver of such obligations of Contractor.

B.11.3 Contractor shall not assign, sell, or transfer its rights, or delegate its responsibilities under this Contract, in whole or in part, without the prior written approval of the Owner. No such written approval shall relieve Contractor of any obligations of this Contract, and any transferee shall be considered the agent of the Contractor and bound to perform in accordance with the Contract Documents. Contractor shall remain liable as between the original parties to the Contract as if no assignment had occurred.

#### **B.12 SUCCESSORS IN INTEREST**

The provisions of this Contract shall be binding upon and shall accrue to the benefit of the parties to the Contract and their respective permitted successors and assigns.

#### **B.13 OWNER'S RIGHT TO DO WORK**

Owner reserves the right to perform other or additional work at or near the project site with other forces than those of the Contractor. If such work takes place within or next to the project site, Contractor shall coordinate work with the other contractors or forces, cooperate with all other contractors or forces, carry out the Work in a way that will minimize interference and delay for all forces involved, place and dispose of materials being used so as not to interfere with the operations of another, and join the Work with the work of the others in an acceptable manner and perform it in proper sequence to that of the others. The Owner will resolve any disagreements that may arise between or among Contractor and the other contractors over the method or order of doing all work (including the Work). In case of unavoidable interference, the Owner will establish work priority (including the Work) which generally will be in the sequence that the contracts were awarded.

#### **B.14 OTHER CONTRACTS**

In all cases and at any time, the Owner has the right to execute other contracts related to or unrelated to the Work of this Contract. The Contractor of this Contract shall fully cooperate with any and all other contractors without additional cost to the Owner in the manner described in section B.13.

#### **B.15 GOVERNING LAW**

This Contract shall be governed by and construed in accordance with the laws of the State of Oregon without regard to principles of conflict of laws.

#### **B.16 LITIGATION**

Any Claim between Owner and Contractor that arises from or relates to this Contract and that is not resolved through the Claims Review Process in Section D.3 shall be brought and conducted solely

and exclusively within the Circuit Court of Benton County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by the State of Oregon on any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. CONTRACTOR, BY EXECUTION OF THIS CONTRACT, HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION B.16.

#### **B.17 ALLOWANCES**

B.17.1 The Contractor shall include in the Contract Price 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.

B.17.2 Unless otherwise provided in the Contract Documents:

- (a) When finally reconciled, allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- (b) 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 Price but not in the allowances;
- (c) Whenever costs are more than or less than allowances, the Contract Price shall be adjusted accordingly by Amendment. The amount of the Amendment shall reflect (i) the difference between actual costs and the allowances under Section B.17.2 (a) and (2) changes in Contractor's costs under Section B.17.2 (b).
- (d) Unless Owner requests otherwise, Contractor shall provide to Owner a proposed fixed price for any allowance work prior to its performance.

#### **B.18 SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

B.18.1 The Contractor shall prepare and keep current, for the Architect's/Engineer's approval (or for the approval of Owner if approval authority has not been delegated to the Architect/Engineer), a schedule and list of Submittals which is coordinated with the Contractor's construction schedule and allows the Architect/Engineer reasonable time to review Submittals. Owner reserves the right to finally approve the schedule and list of Submittals. Submittals include, without limitation, Shop Drawings, product data, and samples which are described below:

- (a) Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor (including any sub-subcontractor), manufacturer, supplier or distributor to illustrate some portion of the Work.
- (b) 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.
- (c) Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

- B.18.2 Shop Drawings, Product Data, Samples and similar Submittals are not Contract Documents. The purpose of their Submittal is to demonstrate for those portions of the Work for which Submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review of Submittals by the Architect/Engineer 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, or for approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's Submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Informational Submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.
- B.18.3 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect/Engineer Shop Drawings, Product Data, Samples and similar Submittals required by the Contract Documents 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. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect/Engineer without action.
- B.18.4 Approving and submitting shop drawings, product data, samples and similar Submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such Submittals with the requirements of the Work and of the Contract Documents.
- B.18.5 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/Engineer.
- B.18.6 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/Engineer's review or approval of Shop Drawings, Product Data, Samples or similar Submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and (i) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work, or (ii) a Supplement Amendment or Construction Change Directive has been executed by Owner 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/Engineer's review or approval thereof.
- B.18.7 In the event that Owner elects not to have the obligations and duties described under this Section B.18 performed by the Architect/Engineer, or in the event no Architect/Engineer is employed by Owner on the project, all obligations and duties assigned to the Architect/Engineer hereunder shall be performed by the Owner.

## **B.19 SUBSTITUTIONS**

The Contractor may make Substitutions only with the written consent of the Owner, after evaluation by the Owner and only in accordance with a Supplement Amendment or Construction Change Directive. Substitutions shall be subject to the requirements of the bid documents. By making requests for Substitutions, the Contractor: represents that the Contractor has personally investigated the proposed substitute product; represents that the Contractor will provide the same warranty for the Substitution that the Contractor would for the product originally specified unless approved otherwise; certifies that the cost data presented is complete and includes all related costs under this Contract including redesign costs, and waives all claims for additional costs related to the Substitution which subsequently become apparent; and will coordinate the installation of the accepted Substitution, making such changes as may be required for the Work to be completed in all respects.

## **B.20 USE OF PLANS AND SPECIFICATIONS**

Plans, Specifications and related Contract Documents furnished to Contractor by Owner or Owner's Architect/Engineer shall be used solely for the performance of the Work under this Contract. Contractor and its Subcontractors and suppliers are authorized to use and reproduce applicable portions of such documents appropriate to the execution of the Work, but shall not claim any ownership or other interest in them beyond the scope of this Contract, and no such interest shall attach. Unless otherwise indicated, all common law, statutory and other reserved rights, in addition to copyrights, are retained by Owner.

## **B.21 FUNDS AVAILABLE AND AUTHORIZED**

If Owner fails to receive funding, appropriations, allocations or other expenditure authority as contemplated by Owner's budget and Owner determines, in its assessment and ranking of the policy objectives explicit or implicit in Owner's budget, Owner may determine it is necessary to and may terminate the Reserve Contract and or any Reserve Contract Supplements.

## **B.22 NO THIRD PARTY BENEFICIARIES**

Owner and Contractor are the only parties to this Contract and are the only parties entitled to enforce its terms. Nothing in this Contract gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name herein and expressly described as intended beneficiaries of the terms of this Contract.

## **SECTION C WAGES AND LABOR**

### **C.1 MINIMUM WAGE RATES ON PUBLIC WORKS**

Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870. Documents establishing those conditions, as determined by the Commissioner of the Bureau of Labor and Industries (BOLI), are included as attachments to or are incorporated by reference in the Contract Documents. Pursuant to ORS 279C.830(1)(c), Contractor shall pay workers at not less than the specified minimum hourly rate of wage, and shall include that requirement in all subcontracts. If the Work is subject to both the state prevailing wage rate law and the federal Davis-Bacon Act, Contractor shall pay the higher of the applicable state or federal prevailing rate of wage. Contractor shall provide written notice to all workers of the number of hours per day and days per week such workers may be required to work.



**C.2 PAYROLL CERTIFICATION AND FEE REQUIREMENTS**

C.2.1 In accordance with ORS 279C.845, the Contractor and every Subcontractor shall submit written certified statements to the Owner, on the form prescribed by the Commissioner of the Bureau of Labor and Industries, certifying the hourly rate of wage paid each worker which the Contractor or the Subcontractor has employed on the project and further certifying that no worker employed on the project has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract, which certificate and statement shall be verified by the oath of the Contractor or the Subcontractor that the Contractor or Subcontractor has read the certified statement, that the Contractor or Subcontractor knows the contents of the certified statement, and, that to the Contractor's or Subcontractor's best knowledge and belief, the certified statement is true. The certified statements shall set out accurately and completely the payroll records for the prior week, including the name and address of each worker, the worker's correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Certified statements for each week during which the Contractor or Subcontractor has employed a worker on the project shall be submitted once a month, by the fifth business day of the following month. The Contractor and Subcontractors shall preserve the certified statements for a period of ten (10) years from the date of completion of the Contract.

C.2.2 Pursuant to ORS 279C.845 (7), the Owner shall retain 25 percent of any amount earned by the Contractor on this public works project until the Contractor has filed the certified statements required by section C.2.1. The Owner shall pay to the Contractor the amount retained under this subsection within 14 days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.

C.2.3 Pursuant to ORS 279C.845(8), the Contractor shall retain 25 percent of any amount earned by a first-tier Subcontractor on this public works project until the first-tier Subcontractor has filed with the Owner the certified statements required by C.2.1. Before paying any amount retained under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 days after the first-tier Subcontractor files the required certified statement the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.

C.2.4 In accordance with statutory requirements and administrative rules promulgated by the Commissioner of the Bureau of Labor and Industries, the fee required by ORS 279C.825(1) will be paid by Owner to the Commissioner.

**C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS**

C.3.1 As a condition to Owner's performance hereunder, the Contractor shall:

C.3.1.1 Make payment promptly, as due, to all persons supplying to Contractor labor or materials for the prosecution of the Work provided for in this Contract.

C.3.1.2 Pay all contributions or amounts due the State Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the Contract.

C.3.1.3 not permit any lien or claim to be filed or prosecuted against the Owner on account of any labor or material furnished. Contractor will not assign any claims that Contractor has against Owner, or assign any sums due by Owner, to

Subcontractors, suppliers, or manufacturers, and will not make any agreement or act in any way to give Subcontractors a claim or standing to make a claim against the Owner.

C.3.1.4 Pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

C.3.2 As a condition to Owner's performance hereunder, if Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the Contractor of a Subcontractor by any person in connection with the project as such claim becomes due, the proper officer(s) representing the Owner may pay the claim and charge the amount of the payment against funds due or to become due Contractor under this Contract. Payment of claims in this manner shall not relieve the Contractor or the Contractor's surety from obligation with respect to any unpaid claims.

C.3.3 Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier subcontractor, including a material supplier, for the purpose of performing a construction contract, a payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under its subcontract within ten (10) Days out of such amounts as are paid to the Contractor by the public contracting agency under such contract.

C.3.4 All employers, including Contractor, that employ subject workers who work under this contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.

**C.4 PAYMENT FOR MEDICAL CARE**

As a condition to Owner's performance hereunder, Contractor shall promptly, as due, make payment to any person, partnership, association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of such Contractor, all sums of which the Contractor agrees to pay for such services and all moneys and sums which the Contractor has collected or deducted from the wages of personnel pursuant to any law, contract or agreement for the purpose of providing or paying for such services.

**C.5 HOURS OF LABOR**

As a condition to Owner's performance hereunder, no person shall be employed to perform Work under this Contract for more than ten (10) hours in any one day or forty (40) hours in any one week, except in cases of necessity, emergency or where public policy absolutely requires it. In such instances, Contractor shall pay the employee at least time and a half pay:

- (a) For all overtime in excess of eight (8) hours a day or forty (40) hours in any one week when the work week is five consecutive Days, Monday through Friday; or
- (b) For all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four consecutive Days, Monday through Friday; and
- (c) For all Work performed on Saturday and on any legal holiday specified in ORS 279C.540.

This section C.5 will not apply to Contractor's Work under this Contract to the extent Contractor is currently a party to a collective bargaining agreement with any labor organization.

This Section C.5 shall not excuse Contractor from completion of the Work within the time required under this Contract.

**SECTION D  
CHANGES IN THE WORK**

**D.1 CHANGES IN WORK**

D.1.1 The terms of this Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever, without prior written agreement and then only after any necessary approvals have been obtained. A Supplement or Amendment is required, which shall not be effective until its execution by the parties to this Contract and all approvals required by public contracting laws have been obtained.

D.1.2 It is mutually agreed that changes in Plans, quantities, or details of construction are inherent in the nature of construction and may be necessary or desirable during the course of construction. Within the general scope of this Contract, the Owner may at any time, without notice to the sureties and without impairing the Contract, require changes consistent with this Section D.1. All changes to the Work shall be documented and Amendments shall be executed under the conditions of the Contract Documents. Such changes may include, but are not limited to:

- (a) Modification of specifications and design.
- (b) Increases or decreases in quantities.
- (c) Increases or decreases to the amount of Work.
- (d) Addition or elimination of any Work item.
- (e) Change in the duration of the project.
- (f) Acceleration or delay in performance of Work.
- (g) Deductive changes,
- (h) Changed conditions.

Deductive changes are those that reduce the scope of the Work, and shall be made by mutual agreement whenever feasible. In cases of suspension or partial termination under Section J, Owner reserves the right to unilaterally impose a deductive change and to self-perform such Work, for which the provisions of B.13 (Owner's Right to Do Work) shall then apply. Adjustments in compensation shall be made under the provisions of D.1.3, in which costs for deductive changes shall be based upon a Direct Costs adjustment together with the related percentage markup specified for profit, Overhead and other indirect costs, unless otherwise agreed to by Owner.

D.1.3 The Owner and Contractor agree that adjustments to or deletions from the Work shall be administered and compensated according to the following:

- (a) Unit pricing may be utilized at the Owner's option when unit prices or solicitation alternates were provided that established the cost for adjustments to Work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the adjustment to Work.
- (b) If the Owner elects not to utilize unit pricing, or in the event that unit pricing is not available or appropriate, fixed pricing may be used for adjustments to or deletions from the Work. In fixed pricing, the basis of payments or total price shall be agreed upon in writing between the parties to the Contract, and shall be established before the Work is done whenever feasible. Notwithstanding the foregoing, the mark-ups set forth in D.1.3(c) shall be utilized in establishing fixed pricing, and such mark-ups shall not be exceeded. Cost and price data relating to adjustments to or deletions from the Work shall be supplied by Contractor to Owner upon request, but Owner shall be under no obligation to make such requests.
- (c) In the event that unit pricing and fixed pricing are not utilized, then adjustments to or deletions from the Work shall be performed on a cost reimbursement basis for

Direct Costs. Such Work shall be compensated on the basis of the actual, reasonable and allowable cost of labor, equipment, and material furnished on the Work performed. In addition, the following markups shall be added to the Contractor's or Subcontractor's Direct Costs as full compensation for profit, Overhead and other indirect costs for Work directly performed with the Contractor's or Subcontractor's own forces:

On Labor.....	15%
On Equipment.....	10%
On Materials.....	10%

(d) When adjustments to or deletions from the Work under D.1.3(c) are invoiced by an authorized Subcontractor at any level, each ascending tier Subcontractor or Contractor will be allowed a supplemental mark-up on each piece of subcontract Work covered by a an Amendment as follows:

\$0.00 - \$5,000.00	10%, and then
Over \$5,000.00	5%

Notwithstanding the foregoing, the maximum aggregate markup to be billed shall not exceed 10% regardless of the number of subcontract tiers

Payments made to the Contractor shall be complete compensation for Overhead, profit, and all costs that were incurred by the Contractor or by other forces furnished by the Contractor, including Subcontractors, for adjustments to or deletions from the Work pursuant to a Supplement Amendment. Owner may establish a maximum cost for additional Work under this Section D.1.3, which shall not be exceeded for reimbursement without additional written authorization from Owner in the form of a Supplement Amendment. Contractor shall not be required to complete such additional Work without additional authorization.

Any necessary adjustment of Contract Time that may be required as a result of adjustments to or deletions from the Work must be agreed upon by the parties before the start of the revised Work unless Owner authorizes Contractor to start the revised Work before agreement on Contract Time adjustment. Contractor shall submit any request for additional compensation (and additional Contract Time if Contractor was authorized to start Work before an adjustment of Contract Time was approved) as soon as possible but no later than thirty (30) Days after receipt of Owner's request for additional Work. Contractor agrees that this thirty (30) Day notice period is adequate time for it to request and document the amount of additional compensation or adjustment of Contract Time. If Contractor's request for additional compensation or adjustment of Contract Time is not made within the thirty (30) Day time limit, Contractor agrees its requests pertaining to that additional Work shall be barred. The thirty (30) Day time limit for making requests shall not be extended for any reason, including without limitation Contractor's claimed inability to determine the amount of additional compensation or adjustment of Contract Time, unless an extension is granted in writing by Owner. If the Owner denies Contractor's timely request for additional compensation or adjustment of Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process. No other reimbursement, compensation, or payment will be made, except as provided in Section D.1.5 for impact claims.

D.1.4 If any adjustment to Work under Section D.1.3 causes an increase or decrease in the Contractor's cost of, or the Contract Time required for the performance of any other part of the Work under this Contract, Contractor shall submit a written request to the Owner, setting forth the nature and specific extent of the

request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt of Owner's request for adjustments to or deletions from the Work by Contractor.

The thirty (30) Day time limit applies to claims of Subcontractors, suppliers, or manufacturers who may be affected by Owner's request for adjustments to or deletions from the Work and who request additional compensation or an extension of Contract Time to perform; Contractor has responsibility for contacting its Subcontractors, suppliers, or manufacturers within the thirty (30) Day time limit, and including their requests with Contractor's requests. If the request involves Work to be completed by Subcontractors, or materials to be furnished by suppliers or manufacturers, such requests shall be submitted to the Contractor in writing with full analysis and justification for the adjustments to compensation and Contract Time requested. The Contractor shall analyze and evaluate the merits of the requests submitted by Subcontractors, suppliers, and manufacturers to Contractor prior to including those requests and Contractor's analysis and evaluation of those requests with Contractor's requests for adjustments to compensation or Contract Time that Contractor submits to the Owner. Failure of Subcontractors, suppliers, manufacturers or others to submit their requests to Contractor for inclusion with Contractor's requests submitted to Owner within the time period and by the means described in this section shall constitute a waiver of these Subcontractor claims. The Owner will not consider direct requests or claims from Subcontractors, suppliers, manufacturers or others not a party to this Contract. The consideration of such requests and claims under this section does not give any Person, not a party to the Contract the right to bring a claim against Owner, whether in this claims process, in litigation, or in any dispute resolution process.

If the Owner denies the Contractor's request for adjustment to compensation or Contract Time, and the request is timely as set forth herein, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

D.1.5 Contractor agrees that no request or Claim for additional costs or an adjustment of Contract Time shall be allowed if made after receipt of Final Payment application under this Contract. Final Payment application must be made by Contractor within the time required under Section E.6.4.

D.1.6 It is understood that changes in the Work are inherent in construction of this type. The number of changes, the scope of those changes, and the effect they have on the progress of the original Work cannot be defined at this time. The Contractor is notified that numerous changes may be required and that there will be no compensation made, unless and only to the extent otherwise provided in the Contract Documents, to the Contractor directly related to the number of changes. Each change will be evaluated for extension of Contract Time and increase or decrease in compensation based on its own merit.

## **D.2 DELAYS**

D.2.1 Delays in construction include "Avoidable Delays", which are defined in Section D.2.1.1, and "Unavoidable Delays", which are defined in Section D.2.1.2. The effect of Avoidable Delays is described in Section D.2.2 and the effect of Unavoidable Delays is described in Section D.2.3.

D.2.1.1 Avoidable Delays include any delays other than Unavoidable Delays, and include delays that otherwise would be considered Unavoidable Delays but that:

- (a) Could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.

- (b) Affect only a portion of the Work and do not necessarily prevent or delay the prosecution of other parts of the Work or the completion of the whole Work within the Contract Time.
- (c) Do not impact activities on the accepted CPM Construction Schedule.
- (d) Are associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.

D.2.1.2 Unavoidable Delays include delays other than Avoidable Delays that are:

- (a) To the extent caused by any actions of the Owner, or any other employee or agent of the Owner, or by separate contractor employed by the Owner.
- (b) To the extent caused by any site conditions that differ materially from what was represented in the Contract Documents or from conditions that would normally be expected to exist and be inherent to the construction activities defined in the Contract Documents. The Contractor agrees to notify the Owner immediately of differing site conditions before the area has been disturbed. The Owner will investigate the area and make a determination as to whether the conditions differ materially from either the conditions stated in the Contract Documents or those that could reasonably be expected in execution of this particular Contract. If Contractor and Owner agree that a differing site condition exists, any adjustment to compensation or Contract Time will be determined based on the process set forth in Section D.1.5 for adjustments to or deletions from Work. If the Owner disagrees that a differing site condition exists and denies Contractor's request for additional compensation or Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process.
- (c) To the extent caused by Force Majeure acts, events or occurrences that could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.
- (d) To the extent caused by adverse weather conditions. Any adverse weather conditions must be substantiated by documentary evidence that weather conditions were abnormal for the specific time period claimed, could not have been anticipated by the Contractor, and adversely impacted the Project in a manner that could not be avoided by rescheduling the Work or by implementing measures to protect against the weather so that the Work could proceed. A rain, windstorm, high water, or other natural phenomenon for the specific locality of the Work, which might reasonably have been anticipated from the previous 10-year historical records of the general locality of the Work, shall not be construed as abnormal. The parties agree that rainfall greater than the following levels cannot be reasonably anticipated:
  - (i) Daily rainfall equal to, or greater than, 0.50 inch during a month when the monthly rainfall exceeds the normal monthly average by twenty-five percent (25 %) or more.
  - (ii) daily rainfall equal to, or greater than, 0.75 inch at any time.

The Office of the Environmental Data Service of the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce nearest the Project site shall be considered the official agency of record for weather information.

D.2.2 Contractor agrees it is not be entitled to additional compensation or additional Contract Time for Avoidable Delays.

D.2.3 In the event of Unavoidable Delays, based on principles of equitable adjustment, Contractor may be entitled to the following:

- (a) Contractor may be entitled to additional compensation or additional Contract Time, or both, for Unavoidable Delays described in Section D.2.1.2 (a) and (b).
- (b) Contractor may be entitled to additional Contract Time for Unavoidable Delays described in Section D.2.1.2(c) and (d).

In the event of any requests for additional compensation or additional Contract Time, or both, as applicable, arising under this Section D.2.3 for Unavoidable Delays, other than requests for additional compensation or additional Contract Time for differing site conditions for which a review process is established under Section D.2.1.2 (b), Contractor must submit a written notification of the delay to the Owner within two (2) Days of the occurrence of the cause of the delay. This written notification shall state the cause of the potential delay, the project components impacted by the delay, and the anticipated additional Contract Time extension or the additional compensation, or both, as applicable, resulting from the delay. Within seven (7) Days after the cause of the delay has been mitigated, or in no case more than thirty (30) Days after the initial written notification, the Contractor agrees to submit to the Owner, a complete and detailed request for additional compensation or additional Contract Time, or both, as applicable, resulting from the delay. If the Owner denies Contractor's request for additional compensation or adjustment of Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process, provided Contractor has complied with the requirement in this Section D.2.3. Contractor agrees any Claim it may have is barred if Contractor does not comply with the requirements herein.

If Contractor does not timely submit the notices required under this Section D.2, then unless otherwise prohibited by law, Contractor's Claim shall be barred.

### **D.3 CLAIMS REVIEW PROCESS**

D.3.1 All Contractor Claims shall be referred to the Owner for review. Contractor's Claims, including Claims for adjustments to compensation or Contract Time, shall be submitted in writing by Contractor to the Owner within five (5) Days after a denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, provided that such initial request has been submitted in accordance with the requirements and within the time limits established in these General Conditions. Within thirty (30) Days after the initial Claim, Contractor shall submit to the Owner a complete and detailed description of the Claim (the "Detailed Notice") that includes all information required by Section D.3.2. Contractor agrees that, unless the Claim is made in accordance with these time requirements, Contractor voluntarily waived all rights to prosecute its Claim.

D.3.2 The Detailed Notice of the Claim shall be submitted in writing by Contractor and shall include a detailed, factual statement of the basis of the Claim, pertinent dates, Contract provisions which support or allow the Claim, reference to or copies of any documents which support the Claim, the dollar value of the

Claim, and the Contract Time adjustment requested for the Claim. If the Claim involves Work to be completed by Subcontractors, the Contractor will analyze and evaluate the merits of the Subcontractor claim prior to forwarding it and that analysis and evaluation to the Owner. The Owner will not consider direct claims from Subcontractors, suppliers, manufacturers, or others not a party to this Contract. Contractor agrees that it will make no agreement, covenant, or assignment, nor will it commit any other act that will permit or assist any Subcontractor, supplier, manufacturer, or other to directly or indirectly make a claim against Owner.

D.3.3 The Owner will review all Claims and take one or more of the following preliminary actions within ten (10) Days of receipt of the Detailed Notice of a Claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the Claim in whole or in part and identify the reasons for rejection; (4) based on principles of equitable adjustment, recommend approval of all or part of the Claim; or (5) propose an alternate resolution.

D.3.4 The Owner's decision shall be final and binding on the Contractor unless appealed by written notice to the Owner within fifteen (15) Days of receipt of the decision. The Contractor must present written documentation supporting the Claim within fifteen (15) Days of the notice of appeal. After receiving the appeal documentation, the Owner shall review the materials and render a decision within thirty (30) Days after receiving the appeal documents.

D.3.5 The decision of the Owner shall be final and binding unless the Contractor delivers to the Owner its request for mediation, which shall be a non-binding process, within fifteen (15) Days of the date of the Owner's decision. The mediation process will be considered to have commenced as of the date the Contractor delivers the request. Both parties acknowledge and agree that participation in mediation is a prerequisite to commencement of litigation of any disputes relating to the Contract. Both parties further agree to exercise their best efforts in good faith to resolve all disputes within sixty (60) Days of the commencement of the mediation through the mediation process set forth herein.

In the event that a lawsuit must be filed within this sixty (60) Day period in order to preserve a cause of action, the parties agree that, notwithstanding the filing, they shall proceed diligently with the mediation to its conclusion prior to actively prosecuting the lawsuit, and shall seek from the Court in which the lawsuit is pending such stays or extensions, including the filing of an answer, as may be necessary to facilitate the mediation process. Further, in the event settlements are reached on any issues through mediation, the plaintiff shall promptly cause to be entered by the Court a stipulated general judgment of dismissal with prejudice, or other appropriate order limiting the scope of litigation as provided in the settlement.

D.3.6 Should the parties arrive at an impasse regarding any Claims or disputed Claims, it is agreed that the parties shall participate in mediation as specified in Section D.3.5. The mediation process will be considered to have been commenced as of the date one party delivers to the other its request in writing to mediate. The mediator shall be an individual mutually acceptable to both parties, but in the absence of agreement each party shall select a temporary mediator and the temporary mediators shall jointly select the permanent mediator. Each party shall pay its own costs for the time and effort involved in mediation. The cost of the mediator shall be split equally between the two parties. Both parties agree to exercise their best effort in good faith to resolve all disputes in mediation. Participation in mediation is a mandatory requirement of both the Owner and the Contractor. The schedule, time and place for mediation will be mutually

acceptable, or, failing mutual agreement, shall be as established by the mediator. The parties agree to comply with Owner's administrative rules governing the confidentiality of mediation, if any, and shall execute all necessary documents to give effect to such confidentiality rules. In any event, the parties shall not subpoena the mediator or otherwise require the mediator to produce records, notes or work product, or to testify in any future proceedings as to information disclosed or representations made in the course of mediation, except to the extent disclosure is required by law.

D.3.7 Unless otherwise directed by Owner, Contractor shall proceed with the Work while any Claim, or mediation or litigation arising from a Claim, is pending. Regardless of the review period or the final decision of the Owner, the Contractor shall continue to diligently pursue the Work as identified in the Contract Documents. In no case is the Contractor justified or allowed to cease or Delay Work, in whole or in part, without a written stop work order from the Owner.

## **SECTION E PAYMENTS**

### **E.1 SCHEDULE OF VALUES**

The Contractor shall submit, at least ten (10) Days prior to submission of its first application for progress payment, a schedule of values ("Schedule of Values") for the contracted Work. This schedule shall provide a breakdown of values for the contracted Work and will be the basis for progress payments. The breakdown shall demonstrate reasonable, identifiable, and measurable components of the Work. Unless objected to by the Owner, this schedule shall be used as the basis for reviewing Contractor's applications for payment. If objected to by Owner, Contractor shall revise the schedule of values and resubmit the same for approval of Owner.

### **E.2 APPLICATIONS FOR PAYMENT**

E.2.1 Owner shall make progress payments on the Contract monthly as Work progresses, in accordance with the requirements of this Section E.2. Applications for payment shall be based upon estimates of Work completed and the Schedule of Values. As a condition precedent to Owner's obligation to pay, all applications for payment shall be approved by the Owner. A progress payment shall not be considered acceptance or approval of any Work or waiver of any defects therein. Owner shall pay to Contractor interest for overdue invoices at the rate of two-thirds of one percent per month on the progress payment, not including retainage, due the Contractor. Overdue invoices will be those that have not been paid within forty five (45) days from the latest of:

- (a) The date of the receipt of the accurate invoice;
- (b) The date Owner receives the correct application for payment if no invoice is received;
- (c) The date all goods and services have been received; or
- (d) The date a Claim is made certain by agreement of the parties or by operation of law.

Notwithstanding the foregoing, in instances when an application for payment is filled out incorrectly, or when there is any defect or impropriety in any submitted application or when there is a good faith dispute, Owner shall so notify the Contractor within fifteen (15) Days stating the reason or reasons the application for payment is defective or improper or the reasons for the dispute. A defective or improper application for payment, if corrected by the Contractor within seven (7) Days of being notified by the Owner, shall not cause a payment to be made later than specified in this section unless interest is also paid. Payment of interest

will be postponed when payment on the principal is delayed because of disagreement between the Owner and the Contractor. Owner reserves the right, instead of requiring the Contractor to correct or resubmit a defective or improper application for payment, to reject the defective or improper portion of the application for payment and pay the remainder of the application for such amounts which are correct and proper.

Owner, upon written notice to the Contractor, may elect to make payments to the Contractor only by means of Electronic Funds Transfers (EFT) through Automated Clearing House (ACH) payments. If Owner makes this election, the Contractor shall arrange for receipt of the EFT/ACH payments.

E.2.2 Contractor shall submit to the Owner an application for each payment and, if required, receipts or other vouchers showing payments for materials and labor including payments to Subcontractors. Contractor shall include in its application for payment a schedule of the percentages of the various parts of the Work completed, based on the Schedule of Values which shall aggregate to the payment application total, and shall include, on the face of each copy thereof, a certificate in substantially the following form:

"I, the undersigned, hereby certify that the above bill is true and correct, and the payment therefore, has not been received.

Signed: \_\_\_\_\_  
Dated: \_\_\_\_\_"

E.2.3 Generally, applications for payment will be accepted only for materials that have been installed. Under special conditions, applications for payment for stored materials will be accepted at Owner's sole discretion. Such a payment, if made, will be subject to the following conditions:

- (a) The request for stored material shall be submitted at least thirty (30) Days in advance of the application for payment on which it appears. Applications for payment shall be entertained for major equipment, components or expenditures only.
- (b) The Contractor shall submit applications for payment showing the quantity and cost of the material stored.
- (c) The material shall be stored in a bonded warehouse and Owner shall be granted the right to access the material for the purpose of removal or inspection at any time during the Contract Period.
- (d) The Contractor shall name the Owner as co-insured on the insurance policy covering the full value of the property while in the care and custody of the Contractor until it is installed. A certificate noting this coverage shall be issued to the Owner.
- (e) Payments shall be made for materials and equipment only. The submitted amount in the application for payment shall be reduced by the cost of transportation from the storage site to the project site and for the cost of an inspector to verify delivery and condition of the goods at the storage site. The cost of storage and inspection shall be borne solely by the Contractor.
- (f) Within sixty (60) Days of the application for payment, the Contractor shall submit evidence of payment covering the material and/or equipment stored and of payment for the storage site.
- (g) Payment for stored materials and/or equipment shall in no way indicate acceptance of the materials and/or equipment or waive any rights under this Contract for the rejection of the Work or materials and/or equipment not in conformance with the Contract Documents.

(h) All required documentation shall be submitted with the respective application for payment.

E.2.4 The Owner reserves the right to withhold all or part of a payment, or may nullify in whole or part any payment previously made, to such extent as may be necessary in the Owner's opinion to protect the Owner from loss because of:

- (a) Work that is defective and not remedied, or that has been demonstrated or identified as failing to conform with Applicable Laws or the Contract Documents,
- (b) Third party claims filed or evidence reasonably indicating that such claims will likely be filed unless security acceptable to the Owner is provided by the Contractor;
- (c) Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment (in which case Owner may issue checks made payable jointly to Contractor and such unpaid persons under this provision, or directly to Subcontractors and suppliers at any level under Section C.3.2.);
- (d) Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;
- (e) Damage to the Work, Owner or another contractor;
- (f) Reasonable evidence that the Work will not be completed within the Contract Time required by the Contract, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- (g) Failure to carry out the Work in accordance with the Contract Documents; or
- (h) Assessment of liquidated damages, when withholding is made for offset purposes.

E.2.5 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- (a) Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the Schedule of Values, less retainage as provided in Section E.5. Pending final determination of cost to the Owner of changes in the Work, no amounts for changes in the Work can be included in applications for payment until the Contract Price has been adjusted by a Supplement Amendment;
- (b) Add that portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner pursuant to Section E.2.3, suitably stored off the site at a location agreed upon in writing), less retainage as provided in Section E.5;
- (c) Subtract the aggregate of previous payments made by the Owner; and
- (d) Subtract any amounts for which the Owner has withheld or nullified payment as provided in the Contract Documents.

E.2.6 Contractor's applications for payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.

E.2.7 The Contractor warrants to Owner 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 payments are received from the Owner shall 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 financing, labor, materials and equipment relating to the Work.

E.2.8 If Contractor disputes any determination by Owner with regard to any application for payment, Contractor nevertheless shall continue to expeditiously perform the Work. No payment made hereunder shall be or be construed to be final acceptance or approval of that portion of the Work to which such partial payment relates or shall relieve Contractor of any of its obligations hereunder.

E.2.9 Contractor shall submit its initial MWESB Report within ten (10) Days of Contractor's execution of the Contract, or if there will be a Guaranteed Maximum Price (GMP) Amendment, then within ten (10) Days of Contractor's execution of the GMP Amendment. Contractor shall submit annual MWESB Reports on June 30 of each year the Contract is active. Contracts (or GMP Amendments) first executed by Contractor within ninety (90) Days before June 30 of the year of execution by Contractor may at the discretion of Owner be exempt from submitting the annual MWESB Report otherwise due on that June 30. The final MWESB Report shall be filed with the application for final payment. Timely receipt of MWESB Reports by Owner shall be a condition precedent to Owner's obligation to pay any progress payments or final payment otherwise due.

### **E.3 PAYROLL CERTIFICATION REQUIREMENT**

Owner's receipt of payroll certification pursuant to Section C.2 of this Contract shall be a condition precedent to Owner's obligation to pay any progress payments or final payment otherwise due.

### **E.4 DUAL PAYMENT SOURCES**

Contractor shall not be compensated for Work performed under this Contract from any state agency other than the agency that is a party to this Contract.

### **E.5 RETAINAGE**

E.5.1 Retainage shall be withheld and released in accordance with the requirements set forth in OSU standards and policies.

E.5.1.1 Owner may reserve as retainage from any progress payment an amount not to exceed five percent of the payment. As Work progresses, Owner may reduce the amount of retainage on or may eliminate retainage on any remaining monthly Contract payments after 50 percent of the Work under the Contract is completed if, in the Owner's discretion, such Work is progressing satisfactorily. Elimination or reduction of retainage shall be allowed only at Owner's sole discretion and only upon written application by the Contractor, which application shall include written approval of Contractor's surety; except that when the Work is 97-1/2 percent completed the Owner may, at its discretion and without application by the Contractor, reduce the retained amount to 100 percent of the value of the Work remaining to be done. Upon receipt of written application by the Contractor, Owner shall respond in writing within a reasonable time.

E.5.1.2 Contractor may request in writing:

- (a) To be paid amounts which would otherwise have been retained from progress payments where Contractor has deposited acceptable bonds and securities of equal value with Owner or in

a custodial account or other mutually-agreed account satisfactory to Owner, with an approved bank or trust company to be held in lieu of the cash retainage for the benefit of Owner;

(b) For construction projects over \$1,000,000, that retainage be deposited in an interest bearing account, established through the State Treasurer for state agencies, in a bank, savings bank, trust company or savings association for the benefit of Owner, with earnings from such account accruing to the Contractor; or

(c) That the Owner allow Contractor to deposit a surety bond for the benefit of Owner, in a form acceptable to Owner, in lieu of all or a portion of funds retained, or to be retained. Such bond and any proceeds therefrom shall be made subject to all claims in the manner and priority as set forth for retainage.

When the Owner has accepted the Contractor's election of option (a) or (b), Owner may recover from Contractor any additional costs incurred through such election by reducing Contractor's final payment. Where the Owner has agreed to Contractor's request for option (c), Contractor shall accept like bonds from Subcontractors and suppliers on the project from which Contractor has required retainages.

E. 5.1.3 The retainage held by Owner shall be included in and paid to the Contractor as part of the Final Payment of the Contract Price. The Owner shall pay to Contractor interest at the rate of two-thirds of one percent per month on the final payment due Contractor, interest to commence forty five (45) Days after the date which Owner receives Contractor's final approved application for payment and Work under the Contract has been completed and accepted and to run until the date when final payment is tendered to Contractor. The Contractor shall notify Owner in writing when the Contractor considers the Work complete and deliver to Owner its final application for payment and Owner shall, within fifteen (15) Days after receiving the written notice and the application for payment, either accept the Work or notify the Contractor of Work yet to be performed on the Contract. If Owner does not within the time allowed notify the Contractor of Work yet to be performed to fulfill contractual obligations, the interest provided by this subsection shall commence to run forty five (45) Days after the end of the 15-Day period.

E.5.1.4 Owner will reduce the amount of the retainage if the Contractor notifies the controller of the Owner that the Contractor has deposited in an escrow account with a bank or trust company, in a manner authorized by the Owner, bonds and securities of equal value of a kind approved by the Owner and such bonds and securities have in fact been deposited.

E.5.1.5 Contractor agrees that if Contractor elects to reserve a retainage from any progress payment due to any Subcontractor or supplier, such retainage shall not exceed five percent of the payment, and such retainage withheld from Subcontractors and suppliers shall be subject to the same terms and conditions stated in Subsection E.5 as apply to Owner's retainage from any progress payment due to Contractor.

## **E.6 FINAL PAYMENT**

E.6.1 Upon completion of all the Work under this Contract, the Contractor shall notify the Owner, in writing, that Contractor has completed Contractor's obligations under the Contract and shall prepare its application requesting final payment. Upon receipt of such notice and application for payment, the Owner will inspect the Work, and, if acceptable, submit to the Owner a recommendation as to acceptance of the completed Work and the final estimate of the amount due the Contractor. If the Work is not acceptable, Owner will notify Contractor within fifteen (15) Days of Contractor's request for Final Payment. Upon approval of this final application for payment by the Owner and

compliance by the Contractor with provisions in Section K, and Contractor's satisfaction of other provisions of the Contract Documents as may be applicable, the Owner shall pay to the Contractor all monies due under the provisions of these Contract Documents.

E.6.2 Neither Final Payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner (1) 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 thirty (30) Days' prior written notice has been given to the Owner, (2) 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, (3) consent of surety, if any, to Final Payment and (4), 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.

E.6.3 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.

E.6.4 Contractor agrees to submit its final payment application within ninety (90) Days after Substantial Completion, unless written extension is granted by Owner. Contractor shall not delay Final Payment application for any reason, including without limitation nonpayment of Subcontractors, suppliers, manufacturers or others not a party to this Contract, or lack of resolution of a dispute with Owner or any other person of matters arising out of or relating to the Contract. If Contractor fails to submit its Final Payment application within ninety (90) Days after Substantial Completion, and Contractor has not obtained written extension by Owner, all requests or Claims for additional costs or an extension of Contract Time shall be waived.

## **SECTION F JOB SITE CONDITIONS**

### **F.1 USE OF PREMISES**

Contractor shall confine equipment, storage of materials and operation of Work to the limits indicated by Contract Documents, Applicable Laws, permits or directions of the Owner. Contractor shall follow the Owner's instructions regarding use of premises, if any.

### **F.2 PROTECTION OF WORKERS, PROPERTY AND THE PUBLIC**

F.2.1 Contractor shall maintain continuous and adequate protection of all of the Work from damage and shall protect the Owner, workers and property from injury or loss arising in connection with this Contract. Contractor shall remedy acceptably to the Owner any damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by authorized representatives or personnel of the Owner. Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.

F.2.2 Contractor shall take all necessary precautions for the safety of all personnel on the job site or otherwise engaged in the

undertaking of the Work and shall comply with the Contract Documents, best practices and all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for protection of workers and the public against any hazards created by construction. Contractor shall designate a responsible employee or associate on the Work site, whose duty shall be the prevention of accidents. The name and position of the person designated shall be reported to the Owner. The Owner has no responsibility for Work site safety. Work site safety shall be the responsibility of the Contractor.

F.2.3 Contractor shall not enter upon private property without first obtaining permission from the property owner or its duly authorized representative. Contractor shall be responsible for the preservation of all public and private property along and adjacent to the Work contemplated under the Contract and shall use every precaution necessary to prevent damage thereto. In the event the Contractor damages any property, the Contractor shall at once notify the property owner and make, or arrange to make, full restitution. Contractor shall, immediately and in writing, report to the Owner, all pertinent facts relating to such property damage and the ultimate disposition of the claim for damage.

F.2.4 Contractor shall be responsible for protection of adjacent work areas including impacts brought about by activities, equipment, labor, utilities, vehicles and materials on the site.

Contractor shall verify that all mechanical or electrical equipment in the construction areas that may be affected by the Work is in working order and shall notify the Owner, in writing, of any equipment not in working order prior to the start of the Work. Start of Work will be considered as acknowledgement that all equipment is in good working order. Contractor shall be required to restore equipment to its original, or better, condition upon completion of the project.

F.2.5 Contractor shall at all times direct its activities in such a manner as to minimize adverse effects on the environment. Handling of all materials shall be conducted so no release will occur that may pollute or become hazardous.

F.2.6 In an emergency affecting the safety of life or limb or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Owner, shall act reasonably to prevent threatened loss or injury, and shall so act, without appeal, if instructed by the Owner. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with section D.

### **F.3 CUTTING AND PATCHING**

F.3.1 Contractor shall be responsible for coordinating all cutting, fitting, or patching of the Work to make its several parts come together properly and fit to receive or be received by work of other contractors or Subcontractors shown upon, or reasonably implied by, the Contract Documents.

F.3.2 Contractor shall be responsible for restoring all cut, fitted, or patched surfaces to an original condition; provided, however, that if a different condition is specified in the Contract Documents, then Contractor shall be responsible for restoring such surfaces to the condition specified in the Contract Documents.

### **F.4 CLEANING UP**

From time to time as may be prudent or ordered by the Owner and, in any event, immediately after completion of the Work, the Contractor shall, at its own expense, clean up and remove all refuse and unused materials of any kind resulting from the Work. If Contractor fails to do so within twenty-four hours after notification by the Owner the work may be done by others and the cost charged to the Contractor and deducted from payment due the Contractor.

### **F.5 ENVIRONMENTAL CONTAMINATION**

F.5.1 Contractor shall be held responsible for and shall indemnify, defend (with counsel of Owner's choice), and hold harmless Owner from and against any costs, expenses, damages, claims, and causes of action, (including attorney fees), or any of them, resulting from all spills, releases, discharges, leaks and disposal of environmental pollution, including storage, transportation, and handling during the performance of the Work or Contractor's obligations under the Contract which occur as a result of, or are contributed by, the negligence or actions of Contractor or its personnel, agents, or Subcontractors or any failure to perform in accordance with the Contract Documents (except to the extent otherwise void under ORS 30.140). Nothing in this section F.5.1 shall limit Contractor's responsibility for obtaining insurance coverages required under Section G.3 of this Contract, and Contractor shall take no action that would void or impair such coverages.

F.5.1.1 Contractor agrees to promptly dispose of such spills, releases, discharge or leaks to the satisfaction of Owner and regulatory agencies having jurisdiction in a manner that complies with Applicable Laws. Cleanup shall be at no cost to the Owner and shall be performed by properly qualified and, if applicable, licensed personnel.

F.5.1.2 Contractor shall obtain the Owner's written consent prior to bringing onto the Work site any (i) environmental pollutants or (ii) hazardous substances or materials, as the same or reasonably similar terms are used in any Applicable Laws. Notwithstanding such written consent from the Owner, the Contractor, at all times, shall:

- (a) Properly handle, use and dispose of all environmental pollutants and hazardous substances or materials brought onto the Work site, in accordance with all Applicable Laws;
- (b) Be responsible for any and all spills, releases, discharges, or leaks of (or from) environmental pollutants or hazardous substances or materials which Contractor has brought onto the Work site; and
- (c) Promptly clean up and remediate, without cost to the Owner, such spills, releases, discharges, or leaks to the Owner's satisfaction and in compliance with all Applicable Laws.

F.5.2 Contractor shall report all reportable quantity releases, as such releases are defined in Applicable Laws, including but not limited to 40 CFR Part 302, Table 302.4 and in OAR 340-142-0050, to applicable federal, state, and local regulatory and emergency response agencies. Upon discovery, regardless of quantity, Contractor must telephonically report all releases to the Owner. A written follow-up report shall be submitted to Owner within 48 hours of the telephonic report. Such written report shall contain, as a minimum:

- (a) Description of items released (identity, quantity, manifest numbers, and any and all other documentation required by law.)



- (b) Whether amount of items released is EPA/DEQ reportable, and, if so, when reported.
- (c) Exact time and location of release, including a description of the area involved.
- (d) Containment procedures initiated.
- (e) Summary of communications about the release between Contractor and members of the press or State, local or federal officials other than Owner.
- (f) Description of cleanup procedures employed or to be employed at the site, including disposal location of spill residue.
- (g) Personal injuries, if any, resulting from, or aggravated by, the release.

**F.6 ENVIRONMENTAL CLEAN-UP**

F.6.1 Unless disposition of environmental pollution is specifically a part of this Contract, or was caused by the Contractor (reference F.5 Environmental Contamination), Contractor shall immediately notify Owner of any hazardous substance(s) which Contractor discovers or encounters during performance of the Work required by this Contract. "Hazardous substance(s)" means any hazardous, toxic and radioactive materials and those substances defined as "hazardous substances," "hazardous materials," "hazardous wastes," "toxic substances," or other similar designations in any federal, state, or local law, regulation, or ordinance, including without limitation asbestos, polychlorinated biphenyl (PCB), or petroleum, and any substances, materials or wastes regulated by 40 CFR, Part 261 and defined as hazardous in 40 CFR S 261.3. In addition to notifying Owner of any hazardous substance(s) discovered or encountered, Contractor shall immediately cease working in any particular area of the project where a hazardous substance(s) has been discovered or encountered if continued work in such area would present a risk or danger to the health or well-being of Contractor's or any Subcontractor's work force, property or the environment.

F.6.2 Upon being notified by Contractor of the presence of hazardous substance(s) on the project site, Owner shall arrange for the proper disposition of such hazardous substance(s).

**F.7 FORCE MAJEURE**

A party to this Contract shall not be held responsible for delay or default due to Force Majeure acts, events or occurrences unless they could have been avoided by the exercise of reasonable care, prudence, foresight, and diligence by that party. The Owner may terminate this Contract upon written notice after determining that delay or default caused by Force Majeure acts, events or occurrences will reasonably prevent successful performance of the Contract.

**SECTION G  
INDEMNITY, BONDING, AND INSURANCE**

**G.1 RESPONSIBILITY FOR DAMAGES / INDEMNITY**

G.1.1 Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under this Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, sub-subcontractors of any tier, suppliers, employees, guests, visitors, invitees and agents.

G.1.2 To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner, Architect/Engineer, Architect/Engineer's

consultants, and their respective officers, directors, agents, employees, partners, members, stockholders and affiliated companies (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses (including reasonable attorney fees), demands and actions of any nature whatsoever which arise out of, result from or are related to, (a) any damage, injury, loss, expense, inconvenience or delay described in this Section G.1., (b) any accident or occurrence which happens or is alleged to have happened in or about the project site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects, (c) any failure of the Contractor or its Subcontractors, sub-subcontractors of any tier, suppliers, employees or consultants to observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contractor contained in the Contract Documents or in any subcontract, (d) the negligent acts or omissions of the Contractor, a Subcontractor, sub-subcontractor of any tier suppliers, a consultant or anyone directly or indirectly employed by them or any one of 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 (except to the extent otherwise void under ORS 30.140), and (e) any lien filed upon the project or bond claim in connection with the Work. 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 G.1.2.

G.1.3 In claims against any person or entity indemnified under Section G.1.2 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 G.1.2 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.

**G.2 PERFORMANCE AND PAYMENT SECURITY; PUBLIC WORKS BOND**

G.2.1 When the Contract Price is \$100,000 or more (or \$50,000 or more in the case of Contracts for highways, bridges and other transportation projects), the Contractor shall furnish and maintain in effect at all times during the Contract Period a performance bond in a sum equal to the Contract Price and a separate payment bond also in a sum equal to the Contract Price. Contractor shall furnish such bonds even if the Contract Price is less than the above thresholds if otherwise required by the Contract Documents.

G.2.2 Bond forms furnished by the Owner and notarized by awarded Contractor's surety company authorized to do business in Oregon are the only acceptable forms of performance and payment security, unless otherwise specified in the Contract Documents.

G.2.3 Before execution of the Contract the Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Laws 2015, Chapter 279C, and OAR 839-025-0015, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting any Subcontractor to start Work.

### **G.3 INSURANCE**

G.3.1 General Requirements. The required insurance amounts set forth below do not in any way limit the amount or scope of liability of Contractor under this Contract. The amounts listed indicate only the minimum amounts of insurance coverage Owner is willing to accept to help insure full performance of all terms and conditions of this Contract.

G.3.1.1 Primary Coverage and Non-Contributory Coverage. Insurance carried by Contractor under this Contract shall be primary and non-contributory coverage. The coverages indicated are minimums unless otherwise specified in the Contract Documents.

G.3.1.2 Company Ratings. All policies of insurance must be written by companies having an A.M. Best rating of no less than "A-VII", or equivalent. Owner may, upon thirty (30) days written notice to Contractor, require Contractor to change any carrier whose rating drops below an "A-VII" rating. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to conduct an insurance business and issue policies of insurance in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and which are subject to approval the Owner.

G.3.1.3 Additional Insured. Each liability policy, except Workers' Compensation and Professional Liability, shall be endorsed to include Owner, its officers, trustees, employees and agents as additional insured but only with respect to the Contractor's activities to be performed under this Contract

If Contractor cannot obtain an insurer to name the Owner as additional insured, Contractor shall obtain at Contractor's expense, and keep in effect during the term of this Contract, Owners and Contractors Protective Liability Insurance, naming the Owner as additional insured with minimum limits of \$2,000,000 per occurrence and \$2,000,000 aggregate. This policy must be kept in effect for 36 months following Final Completion. As evidence of coverage, Contractor shall furnish the actual policy to Owner prior to execution of the Contract.

G.3.1.4 Notice of Cancellation or Change. If the Contractor receives a non-renewal or cancellation notice from an insurance carrier affording coverage required herein, or receives notice that coverage no longer complies with the insurance requirements herein, Contractor agrees to notify Owner by fax within five (5) business days with a copy of the non-renewal or cancellation notice, or written specifics as to which coverage is no longer in compliance. When notified by Owner, the Contractor agrees to stop Work pursuant to this Contract, unless all required insurance remain in effect. Any failure to comply with the reporting provisions of this insurance, except for the potential exhaustion of aggregate limits, shall not affect the coverages provided to the Owner.

Owner shall have the right, but not the obligation, of prohibiting Contractor from entering the Work site until a new certificate(s) of insurance is provided to Owner evidencing the replacement coverage. The Contractor agrees Owner reserves the right to withhold payment to Contractor until evidence of reinstated or replacement coverage is provided to Owner.

G.3.1.5 Deductibles and Self-insured Retentions. Any deductible, self-insured retention and/or self-insurance in excess of \$50,000 may be subject to approval by the Owner in writing.

G.3.2 Workers' Compensation. All employees, including Contractor, that employs subject workers who work under this Contract in the State of Oregon shall comply with ORS

656.017 and provide the required Worker's Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with minimum limits of \$1,000,000 each accident; \$1,000,000 disease-each employee; and \$1,000,000 disease-policy limit. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its Subcontractors complies with these requirements. The Contractor shall require proof of such Workers' Compensation coverage by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.

G.3.3 Commercial General Liability. Contractor shall obtain, and keep in effect at Contractor's expense for the term of the Contract, Commercial General Liability Insurance covering bodily injury and property damage in the amount of \$2,000,000 per occurrence and \$4,000,000 aggregate. This insurance shall include personal injury liability, products and completed operations, and contractual liability coverage for the indemnities provided under this Contract (to the extent contractual liability coverage for the indemnity is available in the marketplace).

G.3.4 Automobile Liability. Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Automobile Liability Insurance with "symbol 1" coverage (owned, hired and non-owned vehicles). The coverage may be written in combination with the Commercial General Liability Insurance. Contractor shall provide proof of insurance showing minimum limits of \$2,000,000 combined single limit. Contractor and its Subcontractors shall be responsible for ensuring that all non-owned vehicles maintain adequate Automobile Liability insurance while on site.

G.3.5 Umbrella Liability. Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Umbrella liability Insurance over and above the Commercial General Liability, Automobile Liability and Employers' Liability insurance coverage with minimum limits of \$5,000,000 per occurrence and \$5,000,000 aggregate.

G.3.6 Owner may adjust the insurance amounts required in Section G.3.4, G.3.4, and G.3.5 through the issuance of Supplemental General Conditions and a Contract.

G.3.7 Professional Liability. (if required by issuance of Supplemental General Conditions) Contractor shall obtain, at Contractor's expense, Professional Liability/Errors & Omissions insurance covering damages caused by any negligent error, omission, or professional misconduct of the Contractor. The policy may be either a practice based policy or a policy pertaining to the specific Project. Professional Liability insurance shall have minimum limits of \$3,000,000 each claim and \$3,000,000 aggregate. Contractor shall require that each of its Major Consultants and subcontractors (including structural, civil, mechanical, plumbing, electrical engineering, survey, geotechnical and materials testing) secures and maintains Professional Liability/Errors & Omissions with limits not less than \$2,000,000 each claim and \$2,000,000 aggregate. All other Consultants and subcontractors not listed above shall have limits not less than \$1,000,000 each claim and \$1,000,000 aggregate.

G.3.7.1 Tail Coverage. If the Professional Liability is arranged on a "claims made" basis, tail coverage will be required at the completion of this Contract for a duration of 36 months or the maximum time period available in the marketplace if less than 36 months. Contractor shall furnish certificates of insurance showing tail coverage as described or continuous "claims

made" liability coverage for 36 months following Final Completion. Continuous "claims made" coverage will be acceptable in lieu of tail coverage, provided its retroactive date is on or before the effective date of this Contract. Owner's receipt of the certificate of insurance and/or endorsement evidencing such coverage shall be a condition precedent to Owner's obligation to make final payment and to Owner's final acceptance of Work or services and related warranty (if any).

- G.3.8 Pollution Liability (if required by Owner through issuance of Supplemental General Conditions) Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Pollution liability Insurance in minimum amounts of \$3,000,000 per occurrence and \$3,000,000 aggregate, naming Owner as additional insured, as noted in the Additional Insured section.
- G.3.9 Builders' Risk Insurance – Completed Value Basis. Unless otherwise provided, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, Builders' Risk Insurance in the amount of the initial Contract Sum, plus value of subsequent modifications, change orders, and cost of material supplied or installed by others, comprising total value of the entire Project at the site on a replacement cost basis without optional deductibles. The earthquake and flood insurance sublimits will be equal to the maximum probable loss.
- G.3.9.1 Policy must provide coverage from the time any covered property becomes the responsibility of the Contractor, and continue without interruption during construction, renovation, or installation, including any time during which the covered property is being transported to the construction installation site, or awaiting installation, whether on or off site.
- G.3.9.2 The Builders' Risk Insurance shall include the Owner, the Contractor, subcontractors and sub-tier contractors in the Project as named insureds on the policy, and shall include a waiver of subrogation provision in favor of all parties.
- G.3.9.3 The Builders' Risk Coverage shall be written on a Special Covered Cause of Loss form and shall include theft, vandalism, malicious mischief, collapse, false-work, temporary buildings, transit, debris removal including demolition, increased cost of construction, architect's fees and expenses, flood (including water damage), earthquake, and if applicable, all below and above ground structures, piping, foundations including underground water and sewer mains, piling including the ground on which the structure rests and excavation, backfilling, filling, and grading.
- G.3.9.4 The Builders' Risk shall include a Beneficial Occupancy Clause. The policy shall specifically permit occupancy of the building during construction. Contractor shall take reasonable steps to obtain consent of the insurance company and delete any provisions with regard to restrictions within any Occupancy Clauses within the Builder's Risk Policy.
- G.3.9.5 Equipment Breakdown Coverage (a.k.a. Boiler & Machinery) shall be included as required by the Contract Documents or by law, which shall specifically covers insured equipment during installation and testing (including cold and hot testing).
- G.3.9.6 The Builders' Risk shall include loss of use due to delays in project completion caused by covered peril losses to the Project, including loss of income and rents and soft costs.
- G.3.9.7 The deductible shall not exceed \$50,000 for physical damage and shall be the responsibility of the Contractor. The deductible shall be paid by the Contractor if the Contractor is negligent. The earthquake and flood deductible shall not

exceed 2 percent of each loss or \$50,000, whichever is greater.

- G.3.9.8 OSU shall be provided with a certificate of insurance, as well as a copy of the policy.
- G.3.9.19 The Contractor shall be responsible for the payment of premium, giving or receiving notice of cancellation; and requesting amendments to this policy and accepting amendments to this policy made by the company.
- G.3.9.10 OSU reserves the right to purchase the Builder's Risk insurance policy.
- G.3.10 Builder's Risk Installation Floater. For Work other than new construction, Contractor shall obtain and keep in effect during the term of this Contract, a Builder's Risk Installation Floater for coverage of the Contractor's labor, materials and equipment to be used for completion of the work performed under this Contract. The minimum amount of coverage to be carried shall be equal to the full amount of the Contract. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear. Owner may waive this requirement at their sole and absolute discretion.
- G.3.11 Certificate(s) of Insurance. As evidence of the insurance coverage required by this Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to the execution of the Contract. The certificate(s) will specify all of the parties who are additional insured or loss payees for this Contract, and the applicable endorsements will be attached. Additional insured endorsements must include completed operations without restriction to contractual requirements.
- G.3.12 Subcontractors. Subject to and following the written approval of the Owner as outlined in B.11.3 as related to Subcontracts and Assignment, the Contractor shall require Subcontractors to have insurance as outlined in section G.3.1 through G.3.4; however, the policy limits may be reduced, but no case shall the policy limits be less than \$1,000,000.
- G.3.13 Reserve Contracting Program: For the Reserve Contracting Program the term "Contract" as used in this Section G in the phrases "keep in effect during the term of this Contract" and "prior to execution of the Contract" shall mean each Reserve Contract Supplement issued under the Reserve Contract.

## **SECTION H SCHEDULE OF WORK**

### **H.1 CONTRACT PERIOD**

- H.1.1 Time is of the essence. The Contractor shall at all times carry on the Work diligently, without delay and punctually fulfill all requirements herein. If required by the Contract Documents, Contractor shall commence Work on the site within fifteen (15) Days of Notice to Proceed, unless directed otherwise.
- H.1.2 Unless specifically extended by Supplement Amendment, all Work shall be complete by the date contained in the Contract Documents. The Owner shall have the right to accelerate the completion date of the Work, which may require the use of overtime. Such accelerated Work schedule shall be an acceleration in performance of Work under Section D.1.2 (f) and shall be subject to the provisions of Section D.1.
- H.1.3 The Owner shall not waive any rights under the Contract by permitting the Contractor to continue or complete in whole or in part the Work after the date described in Section H.1.2 above.

### **H.2 SCHEDULE**

- H.2.1 Contractor shall provide, by or before the pre-construction conference, a detailed Construction Schedule for review and

acceptance by the Owner. The submitted Construction Schedule must illustrate Work by significant project components, significant labor trades, long lead items, broken down by building and/or floor where applicable. Each Construction Schedule item shall account for no greater than 5% of the monetary value of the project or 5% of the available time. Construction Schedules with activities of less than one day or valued at less than 1% of the Contract shall be considered too detailed and shall not be accepted. Construction Schedules lacking adequate detail, or unreasonably detailed, shall be rejected. Included within the Construction Schedule are the following: Notice to Proceed, Substantial Completion, and Final Completion. Contractor shall provide an updated, full Project Construction Schedule with each payment request. In addition, twice monthly, the Contractor shall provide an updated three-week forward-looking schedule. Acceptance of the Construction Schedule by the Owner does not constitute agreement by the Owner as to the Contractor's sequencing, means, methods, or durations. Any positive difference between the Contractor's scheduled completion and the contract completion date is float owned by the Project. Use of the float shall be negotiated. In no case shall the Contractor make a claim for delays if the Work is completed within the Contract time but after Contractor's scheduled completion.

### **H.3 PARTIAL OCCUPANCY OR USE**

H.3.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have reasonably accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, insurance or self-insurance, maintenance, heat, utilities, and damage to the Work, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents with respect to such portion of the Work. Approval by the Contractor to partial occupancy or use shall not be unreasonably withheld. Immediately prior to such partial occupancy or use, the Owner and Contractor 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. 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.

## **SECTION I CORRECTION OF WORK**

### **I.1 CORRECTION OF WORK BEFORE FINAL PAYMENT**

The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects, and that the Work will conform to the requirements of the Contract Documents. Work failing to conform to these requirements shall be deemed defective. Contractor shall promptly remove from the premises and replace all defective materials and equipment as determined by the Owner, whether incorporated in the Work or not. Removal and replacement shall be without loss or expense to the Owner, and Contractor shall bear the cost of repairing all Work destroyed or damaged by such removal or replacement. Contractor shall be allowed a period of no longer than thirty (30) Days after Substantial Completion for completion of defective (Punch List) work. At the end of the thirty-day period, or earlier if requested by the Contractor, Owner shall arrange for inspection of the Work by the Architect/Engineer. Should the work not be complete, and all corrections made, the costs for all subsequent re-inspections shall be borne by the Contractor. If Contractor fails to complete the Punch List work within the thirty (30) Day period, Owner

may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand without affecting Contractor's obligations.

### **I.2 WARRANTY WORK**

- I.2.1 Neither the final certificate of payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for defective Work and, unless a longer period is specified, Contractor shall correct all defects that appear in the Work within a period of one year from the date of issuance of the written notice of Substantial Completion by the Owner except for latent defects which will be remedied by the Contractor at any time they become apparent. The Owner shall give Contractor notice of defects with reasonable promptness. The Contractor shall perform the warranty Work by correcting defects within twenty-four (24) hours of notification by Owner, unless otherwise specified in the Contract Documents. Should the Contractor fail to respond within the specified response time, the Owner may, at its option, complete the necessary repairs using another contractor or its own forces. If Owner completes the repairs using Owner's own forces, Contractor shall pay Owner at the rate of one and one-half (1½) times the standard hourly rate of Owner's forces, plus related overhead and any direct non-salary costs. If Owner completes the repairs using another contractor, Contractor shall pay Owner the amount of Owner's direct costs billed by the other contractor for the work, plus the direct salary costs and related overhead and direct non-salary expenses of Owner's forces who are required to monitor that contractor's work. Work performed by Owner using Owner's own forces or those of another contractor shall not affect the Contractor's contractual duties under these provisions, including warranty provisions. In the event of warranty work consisting of emergency repairs, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand, without affecting Contractor's obligations.
- I.2.2 Nothing in this Section I.2 provision shall negate guarantees or warranties for periods longer than one year including without limitation such guarantees or warranties required by other sections of the Contract Documents for specific installations, materials, processes, equipment or fixtures.
- I.2.3 In addition to Contractor's warranty, manufacturer's warranties shall pass to the Owner and shall not take effect until such portion of the Work covered by the applicable warranty has been accepted in writing by the Owner.
- I.2.4 The one-year period for correction of Work shall be extended with respect to portions of Work performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work, and shall be extended by corrective Work performed by the Contractor pursuant to this Section, as to the Work corrected. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.
- I.2.5 Nothing contained in this Section I.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the period for correction of Work as described in this Section I.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.

J.2.6 If the Owner prefers to accept Work which 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 Price will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

## **SECTION J**

### ***SUSPENSION AND/OR TERMINATION OF THE WORK***

#### **J.1 OWNER'S RIGHT TO SUSPEND THE WORK**

J.1.1 The Owner has the authority to suspend portions or all of the Work due to the following causes:

- (a) Failure of the Contractor to correct unsafe conditions;
- (b) Failure of the Contractor to carry out any provision of the Contract;
- (c) Failure of the Contractor to carry out orders;
- (d) Conditions, in the opinion of the Owner, which are unsuitable for performing the Work;
- (e) Time required to investigate differing site conditions;
- (f) Any reason considered to be in the public interest.

J.1.2 The Owner shall notify Contractor and the Contractor's Surety in writing of the effective date and time of the suspension, and Owner shall notify Contractor and Contractor's surety in writing to resume Work.

#### **J.2 CONTRACTOR'S RESPONSIBILITIES**

J.2.1 During the period of the suspension, Contractor is responsible to continue maintenance at the project just as if the Work were in progress. This includes, but is not limited to, protection of completed Work, maintenance of access, protection of stored materials, temporary facilities, and clean-up.

J.2.2 When the Work is recommenced after the suspension, the Contractor shall replace or renew any Work damaged during the suspension, remove any materials or facilities used as part of temporary maintenance, and complete the project in every respect as though its prosecution had been continuous and without suspension.

#### **J.3 COMPENSATION FOR SUSPENSION**

J.3.1 Depending on the reason for suspension of the Work, the Contractor or the Owner may be due compensation by the other party. If the suspension was required due to acts or omissions of Contractor, the Owner may assess the Contractor actual costs of the suspension in terms of administration, remedial work by the Owner's forces or another contractor to correct the problem associated with the suspension, rent of temporary facilities, and other actual costs related to the suspension. If the suspension was caused by acts or omissions of the Owner, the Contractor may be due compensation which shall be defined using Section D, Changes in Work. If the suspension was required through no fault of the Contractor or the Owner, neither party shall owe the other for the impact.

#### **J.4 OWNER'S RIGHT TO TERMINATE CONTRACT**

J.4.1 The Owner may, without prejudice to any other right or remedy, and after giving Contractor seven (7) Days' written notice and an opportunity to cure, terminate the Contract in whole or in part under the following conditions:

- (a) If Contractor should, voluntarily or involuntarily, seek protection under the United States Bankruptcy Code and Contractor as debtor-in-possession or the Trustee for the estate fails to assume the Contract within a reasonable time;
- (b) If Contractor should make a general assignment for the benefit of Contractor's creditors;
- (c) If a receiver should be appointed on account of Contractor's insolvency;
- (d) If Contractor should repeatedly refuse or fail to supply an adequate number of skilled workers or proper materials to carry on the Work as required by the Contract Documents, or otherwise fail to perform the Work in a timely manner;
- (e) If Contractor should repeatedly fail to make prompt payment to Subcontractors or for material or labor, or should disregard laws, ordinances or the instructions of the Owner; or
- (f) If Contractor is otherwise in breach of any part of the Contract.
- (g) If Contractor is in violation of Applicable Laws, either in the conduct of its business or in its performance of the Work.

J.4.2 At any time that any of the above occurs, Owner may exercise all rights and remedies available to Owner at law or in equity, and, in addition, Owner may take possession of the premises and of all materials and appliances and finish the Work by whatever method it may deem expedient. In such case, the Contractor shall not be entitled to receive further payment until the Work is completed. If the Owner's cost of finishing the Work exceeds the unpaid balance of the Contract Price, Contractor shall pay the difference to the Owner.

#### **J.5 TERMINATION FOR CONVENIENCE**

J.5.1 Owner may terminate the Contract in whole or in part whenever Owner determines that termination of the Contract is in the best interest of Owner or the public.

J.5.2 The Owner shall provide the Contractor with seven (7) Days prior written notice of a termination for Owner's or for public convenience. After such notice, the Contractor shall provide the Owner with immediate and peaceful possession of the premises and materials located on and off the premises for which the Contractor received progress payment under Section E. Compensation for Work terminated by the Owner under this provision will be according to Section E. In no circumstance shall Contractor be entitled to lost profits for Work not performed due to termination.

#### **J.6 ACTION UPON TERMINATION**

J.6.1 Upon receiving a notice of termination, and except as directed otherwise by the Owner, Contractor shall immediately cease placing further subcontracts or orders for materials, services, or facilities. In addition, Contractor shall terminate all subcontracts or orders to the extent they relate to the Work terminated and, with the prior written approval of the Owner, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts and orders.

J.6.2 As directed by the Owner, Contractor shall, upon termination, transfer title and deliver to the Owner all Record Documents, information, and other property that, if the Contract had been completed, would have been required to be furnished to the Owner.

J.6.3 Upon Owner's notice of termination pursuant to either Section J.4 or J.5, if Owner shall so elect, Contractor shall assign the Owner such subcontracts and orders as Owner shall specify. In the event Owner elects to take assignment of any such subcontract or order, Contractor shall take such action and shall execute such documents as Owner shall reasonably require for the effectiveness of such assignment and Contractor shall ensure that no contractual arrangement between it and its subcontractors or suppliers of any tier or sub-tier shall prevent such assignment.

## **SECTION K CONTRACT CLOSE OUT**

### **K.1 RECORD DOCUMENTS**

As a condition of final payment (refer also to section E.6), Contractor shall comply with the following: Contractor shall provide Record Documents for the entire project to Owner. Record Documents shall depict the project as constructed and shall reflect each and every change, modification, and deletion made during the construction. Record Documents are part of the Work and shall be provided prior to the Owner's issuance of final payment. Record Documents include all modifications to the Contract Documents unless otherwise directed, and accurate MWESB Reports.

### **K.2 OPERATION AND MAINTENANCE MANUALS**

As part of the Work, Contractor shall submit two completed operation and maintenance manuals ("O & M Manuals") for review by the Owner prior to submission of any pay request for more than 75% of the Work. Owner's receipt of the O & M Manuals shall be a condition precedent to any payment thereafter due. The O & M Manuals shall contain a complete set of all Submittals, all product data as required by the specifications, training information, telephone list and contact information for all consultants, manufacturers, installer and suppliers, manufacturer's printed data, record and shop drawings, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner shall review and return one O & M Manual for any modifications or adjustments required. Prior to submission of its final pay request, Contractor shall deliver two (2) complete and approved sets of O & M Manuals in paper form and one (1) complete and approved set in electronic form to the Owner and Owner's receipt of the O & M Manuals shall be a condition precedent to Owner's obligation to make final payment.

### **K.3 COMPLETION NOTICES**

K.3.1 Contractor shall provide Owner written notice of both Substantial and Final Completion. The certificate of Substantial Completion shall state the date of Substantial Completion, the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and the time within which the Contractor shall finish all items on the Punch List accompanying the Certificate. Both completion notices must be signed by the Contractor and the Owner to be valid. The Owner shall provide the final signature on the notices. The notices shall take effect on the date they are signed by the Owner.

K.3.2 Substantial Completion of a facility with operating systems (e.g., mechanical, electrical, HVAC) shall be that degree of completion that has provided a minimum of thirty (30) continuous Days of successful, trouble-free operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the Owner. All equipment contained in the Work, plus all other components necessary to enable the Owner to operate the facility in the manner that was intended, shall be complete on the Substantial Completion date. The Contractor may request that a Punch List be prepared by the Owner with submission of the request for the Substantial Completion notice.

### **K.4 TRAINING**

As part of the Work, and prior to submission of the final application for payment, the Contractor shall schedule with the Owner training sessions for all equipment and systems as required by the Contract Documents. Contractor shall schedule training sessions at least two weeks in advance of the date of training to allow Owner to provide its personnel with adequate notice. The O & M Manual shall be used as a basis for training. In addition to any off-site training required by the Contract Documents, training shall include a formal session conducted at the Work site after the equipment and/or system is completely installed and operational in its normal operating environment.

### **K.5 EXTRA MATERIALS**

As part of the Work, Contractor shall provide spare parts, extra maintenance materials, and other materials or products in the quantities specified in the Contract Documents prior to final payment. Delivery point for extra materials shall be designated by the Owner.

### **K.6 ENVIRONMENTAL CLEAN-UP**

As part of the Final Completion notice, or as a separate written notice submitted with or before the notice of Final Completion, the Contractor shall notify the Owner that all environmental and pollution clean-up, remediation and closure have been completed in accordance with all Applicable Laws and pursuant to the authority of all agencies having jurisdiction, and Contractor shall provide Owner with any and all documentation related to the same, including but not limited to directives, orders, letters, certificates and permits related to or arising from such environmental pollution. The notice shall reaffirm the indemnification given under Section F.5.1 above. Contractor's completion of its obligations under this Section K.6 and Owner's receipt of documents evidencing such completion shall be a condition precedent to Owner's obligation to make final payment.

### **K.7 CERTIFICATE OF OCCUPANCY**

Owner's receipt of an unconditioned certificate of occupancy from the appropriate state and/or local building officials shall be a condition precedent to Owner's obligation to make final payment, except to the extent failure to obtain an unconditional certificate of occupancy is due to the sole fault or neglect of Owner.

### **K.8 OTHER CONTRACTOR RESPONSIBILITIES**

The Contractor shall be responsible for returning to the Owner all property of Owner issued to Contractor during construction such as keys, security passes, site admittance badges, and all other pertinent items. Upon notice from Owner, Contractor shall be responsible for notifying the appropriate utility companies to transfer utility charges from the Contractor to the Owner. The utility transfer date shall not be before Substantial Completion and may not be until Final Completion, if the Owner does not take beneficial use of the facility and the Contractor's forces continue with the Work.

### **K.9 SURVIVAL**

All warranty and indemnification provisions of this Contract, and all of Contractor's other obligations under this Contract that are not fully performed by the time of Final Completion or termination, shall survive Final Completion or any termination of the Contract.

As indicated in the General Conditions of your contract(s) Section E.2.9, OSU requires that we gather MWESB (Minority, Women's Emerging Small Business) Contractor/Subcontractor information. This is an Oregon State University requirement and the information will be gathered annually and at time of final payment.

- **You must do this step first or the report will not let you add any information:** In Row 1 Column B there is a drop down menu. You must select yearend (if the job has not been completed) or final (if the job is completed and you have submitted for retention). Once you choose yearend or final in the drop down menu there will be areas highlighted in light green and red. Those are the areas that you are required to fill out. If you did not use or planning to use any MWESB then the left side of the report (Light Green area) still needs to be filled out and the red area needs to remain blank.
- If your agency is an MWESB or if you are using/used an MWESB subcontractor then you need to fill out the information in the report that is highlighted in light green and red (see instructions in the next bullet). If you are not an MWESB or used a Subcontractor that is an MWESB then you need to fill out the left side of the form (Light Green areas) and leave the red area blank.
- In row 2 Column B there is another drop down menu, click the drop down menu and choose Fiscal Year 2015.
- In Row 4 Column B there is another drop down menu, click there and choose OSU.





In compliance with Oregon Prevailing Wage Law, the following is incorporated into this Invitation to Bid:

The Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates as outlined in Sections C.1 and C.2 of the General Conditions. This Purchase Order is subject to the following BOLI wage rate requirements, which are incorporated herein by reference:

- [April 1, 2019 PWR Apprenticeship Rates](#)
- [April 1, 2019 PWR Amendments](#)
- [January 1, 2019 Prevailing Wage Rates for Public Works Contracts in Oregon](#)
- [July 1, 2018 Definitions of Covered Occupations for Public Works Contracts in Oregon](#)

These BOLI wage rates are available on line at:

**[http://www.boli.state.or.us/BOLI/WHD/PWR/pwr\\_state.shtml](http://www.boli.state.or.us/BOLI/WHD/PWR/pwr_state.shtml)**

DIXON RECREATION CENTER RENOVATION  
OREGON STATE UNIVERSITY

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PROJECT MANUAL  
SPECIFICATIONS DIVISIONS 01 - 26

CONSTRUCTION DOCUMENTS  
APRIL 17, 2019



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END OF DOCUMENT

## SECTION 01 11 00

### SUMMARY OF WORK

#### PART 1 GENERAL

##### 1.01 SUMMARY OF WORK

- A. The Work Contract consists of renovation to the Dixon Recreation Center on the Oregon State University Campus, Corvallis, Oregon.
- B. Work shall be started within ten (10) calendar days after signing of Contract on behalf of Oregon State University. The Contract may not be signed prior to approval of the Contractor's Certificate of Insurance by Construction Contract Administration (CCA), Oregon State University. Work shall be completed within 90 calendar days of date of executed Contract.

##### 1.02 WORK PERFORMED BY OWNER

###### A. Owner Furnished, Owner Installed (OFOI) Work:

###### 1. Resilient Athletic Flooring and Synthetic Turf Flooring

a. Resilient Athletic Flooring and Synthetic Turf Flooring will be provided by and installed by owner. Work provided by owner includes required floor preparation and installation of flooring material. Contractor is to be responsible for all required floor wood subfloor patching and replacement as required after installation of required structural steel. Reference demo drawings for more information.

###### 2. Theatrical Lighting and Controls

a. Theatrical lighting and controls for Multi-Exercise 126, as identified on electrical and lighting drawings, will be owner furnished and owner installed. Contractor is to provide electrical rough in for all OFOI light fixtures as indicated on electrical and lighting drawings.

###### 3. All items listed as OFOI.

B. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

##### 1.03 CONTRACTORS USE OF PREMISES

###### A. Contractor shall limit use of the Premises for work and storage to allow for:

- 1. Owner occupancy, day and night.
- 2. Public use, day and night.
- 3. Security.
- 4. Safe entry and exit for vehicles and pedestrians.
- 5. Fire egress.

###### B. Coordinate all operations with the Owner's Authorized Representative during

the construction period. A 96 hour notification is required prior to scheduled utility shutdowns or street closures, but more lead time is often required to schedule around other critical activities.

- C. Limit Contractor's employee parking to locations designated at the Pre-construction Conference.

#### **1.04 OWNER OCCUPANCY**

- A. The Owner will occupy the Premises during the entire period of construction for the conduct of normal operations. Cooperate with Owner's Authorized Representative in construction operations to minimize conflict and to facilitate the Owner's usage especially in the following areas:
  - 1. Restricted access and parking.
  - 2. Use of stairs.
  - 3. Storage space availability.
- B. Conduct operations in such a way to ensure the least inconvenience to the general public, including:
  - 1. Limitations and easements.
  - 2. Emergency vehicle access.
  - 3. Building access to the public, day and night.

#### **1.05 ASBESTOS AND OTHER HAZARDOUS MATERIAL**

- A. The Owner has made a reasonable attempt to locate and identify asbestos or other hazardous material that may be encountered during the course of the Work.
- B. If the Contractor observes or suspects the existence of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials in the structure or components of the building, the Contractor shall immediately stop work and notify the Owner's Authorized Representative.
- C. The Owner will arrange for the removal of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials as required by Facilities Services personnel or by separate contract.
- D. Schedule ten (10) days of slack or "down" time for the removal of hazardous materials without penalty to Owner for the delay of the Contract.

#### **1.06 LEAD BASED PAINT**

- A. The Owner may have tested existing paint in the project area and if levels are found the following conditions apply.
- B. Contractor shall remove paint as specified for surface preparation and capture removed material for disposal.
- C. Contractor shall follow OSHA guidelines involving exposure to workers.
- D. Owner will provide containers for Contractor's use at project site.



- E. Contractor shall comply with the requirements of DEQ and EPA and shall submit a lead abatement plan.
- F. Contractor shall separate lead contaminated material from effluent and water.
- G. Owner will dispose of lead paint and effluent resulting from stripping operation.
- H. Soil contaminated by stripping operations shall be replaced with topsoil.

**END OF SECTION**

## SECTION 01 23 00

### ALTERNATES

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. The alternates described in this Section may be exercised at the option of the Owner within 60 days of the execution of the Contract.
- B. It is generally the practice of the Owner to exercise alternates in numerical order.
- C. The Owner reserves the right to accept the alternates without regard to order or sequence; but, such acceptance shall not impair the selection of a low, responsible and responsive bidder to whom the Contract may be awarded under an equitable bid procedure.

##### 1.02 QUALITY ASSURANCE

- A. For each alternate which is accepted, coordinate the work of the various trades involved, and modify surrounding work as required to complete the project as intended.
- B. In the change-in-price figure for each alternate, include incidental costs which are attributable to adjustments in the work of other trades which may be required to achieve the contemplated and final conditions.
- C. Questions:
  - 1. If there is a question regarding the extent, scope, nature, or intent of the alternates, contact the Owner's Authorized Representative for clarification.
  - 2. Failure on the part of the Contractor to clarify any unclear items shall not relieve the Contractor of the responsibility for performing the selected alternates in accordance with the intent and requirements of the Project Manual and Drawings.
  - 3. The description of the alternates hereinafter is qualitative and not quantitative; the Contractor shall determine the quantities of labor and materials and the extent of same required to execute the selected alternates in accordance with the intent and requirements of the Project Manual and Drawings.
  - 4. The applicable Sections of the Specifications apply to the work under each alternate.

##### 1.03 LIST OF ALTERNATES

- A. Alternate 1: Casework in Multi-Exercise Rooms 126, 130, and 132
  - 1. Base Bid: Provide casework, bench, cabinets, and coat hooks as shown in documents.

2. Deductive Alternate: Provide no casework bench, cabinets, and coat hooks at entry of Multi-Exercise 126, 130, and 132. Provide Wall Type N-W1.6.B.A. from Level 1 to Level 2 in location where casework is indicated. Provide RB-1 at wall base. Paint walls PT-2.
- B. Alternate 2: Opening Between Multi-Exercise 130 and Multi-Exercise 132
1. Base Bid: Provide opening between Multi-Exercise 130 and Multi-Exercise 132 as indicated in drawings.
  2. Deductive Alternate: Provide no new opening between Multi-Exercise Rooms 130 and 132. Eliminate all scope of work associated with opening including saw cutting of existing CMU wall, fabrication and installation of steel support structure, and fabrication and installation of architectural trim. Install wall finishes to match adjacent wall including AWP and MDF panels. Install L11 light fixture continually on wall per adjacent wall details.

**END OF SECTION**

## SECTION 01 24 76

### APPLICATIONS FOR PAYMENT

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Work of this Section includes forms and procedures for progress payments.
- B. Related work specified elsewhere.
  - 1. For the primary discussion of payments, refer to OSU General Conditions, Section E, as supplemented.
  - 2. In compliance with OSU General Conditions, Section K, no payments beyond 75% will be made by the Owner before two complete copies of the draft Operation and Maintenance Manuals have been received for review by the Owner.

##### 1.02 APPLICATION FORMS

- A. For applications for payment, use sample contract payment request on company letterhead, or AIA Document G702, supported by AIA Document G703, Continuation Sheet, or similar document.
- B. Prepare the Schedule of Values in such a manner that each major item of Work and each subcontracted item of Work is shown as a line item broken down in terms of material and labor costs on AIA Document G703, Application Certification of Payment, Continuation Sheet or similar format. The sample continuation sheet shall be the minimum Schedule of Values breakdown.
- C. The Schedule of Values shall be submitted for review by the Owner prior to the first application for payment; and may be used when, and only when, accepted in writing by the Owner.
- D. Payment request is to include the Contractor's Federal Tax Identification number and return address.

##### 1.03 PAYMENTS

- A. The Owner will make progress payments on account of the Contract once monthly for the scheduled duration of the project (i.e. three (3) payments on a three-month project), based on the value of work accomplished or materials on the job site, as stated in the Schedule of Values on the Application and Certificate Payment.
- B. Notwithstanding the foregoing, as this project is scheduled to take \_\_\_\_\_ months to complete, Owner will only make \_\_\_\_\_ payments, plus a final retainage payment, as applicable.
- C. Complete and forward Application to the Owner on or about the 15th day of each month for work performed the previous month and include certified payroll statements as specified in the OSU General Conditions.

- D. Submit one (1) copy of forms requesting payment to the Owner.
- E. Payments will be made on protected materials on hand at the job site properly stored, protected, and insured.
- F. Estimated quantities shall be subject to the Owner's review and judgment.

**1.04 EARLY PURCHASE AND PAYMENT OF MATERIALS AND EQUIPMENT**

- A. Order materials and equipment requiring a long lead or waiting time early so as not to delay progress of the Work.
- B. The Contractor will be reimbursed for early order materials or equipment upon receipt and verification of quality and quantity against submittals and shipping documents by the Owner's Authorized Representative.
- C. Receipt shall be to the job site or stored at Owner's other premises in an orderly and safe manner, secured from normal weather damage.
- D. Security remains the responsibility of the Contractor.

**END OF SECTION**

**CONTRACT PAYMENT REQUEST**

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

**TO:** Administrative Services Accounting  
Oregon State University  
3015 SW Western Blvd  
Corvallis, OR 97333

Payment Request No. \_\_\_\_\_ Contract No. \_\_\_\_\_ Period from \_\_\_\_\_ to \_\_\_\_\_

Project: \_\_\_\_\_

Original Contract Amount..... \$ \_\_\_\_\_

Change Orders (Net Amount) ..... \$ \_\_\_\_\_

Contract Total to Date ..... \$ \_\_\_\_\_

=====

Total Completed and Stored to Date ..... \$ \_\_\_\_\_

Less Retainage (5%), if applicable ..... \$ \_\_\_\_\_

Total Earned, Less Retainage (if applicable)..... \$ \_\_\_\_\_

Less Previous Payments ..... \$ \_\_\_\_\_

**Net Amount Due this Request** ..... \$ \_\_\_\_\_

The undersigned Contractor certifies that, to the best of his/her knowledge, information, and belief, the Work covered by this request has been completed in accordance with the Contract Documents, that all amounts have been paid for Work for which previous applications for Payment were issued and payments received from the Owner, and that the amount shown herein is now due.

Contractor: \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_

Federal Tax ID Number: \_\_\_\_\_

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







## **SECTION 01 25 00**

### **PRODUCT SUBSTITUTION PROCEDURES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. General requirements for the Work in relation to substitutions and product options.
- B. Submit to the Owner's property insurance carrier shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.
- C. Related Work Specified Elsewhere
  - 1. Instructions to Bidders.
  - 2. OSU General Conditions.

##### **1.02 REQUESTS FOR SUBSTITUTIONS**

- A. Requests for substitution of products in place of those specified shall be in accordance with Instructions to Bidders, and as specified herein.

##### **1.03 CONTRACTOR'S RESPONSIBILITIES**

- A. Investigate proposed products and determine that they are equal or superior in all respects to products specified.
- B. Provide same guarantee for accepted substitutions as for products specified.
- C. Coordinate installation of accepted substitutions into the Work, making such changes as may be required for the Work to be complete in all respects.

##### **1.04 SUBSTITUTIONS DURING BIDDING**

- A. Submit two (2) copies of the following information with each request to the Owner:
  - 1. CSI substitution request form.
  - 2. Comparison of proposed substitution with product, material or system specified.
  - 3. Complete data, substantiating compliance of proposed substitution with the Contract Documents.
  - 4. Test numbers and supporting reports, indicating compliance with referenced standards.
  - 5. Evidence that warranty requirements are acceptable.
  - 6. Details indicating specific deviations proposed for the substitution.
  - 7. Reference and applicable Specification sections.
  - 8. Applicable product samples.
- B. All substitution requests shall be received in the Owner's office no less than ten (10) calendar days before bid opening. Requests received after this date will not be considered.

### **1.05 SUBSTITUTIONS DURING CONSTRUCTION**

- A. Substitutions will normally not be considered after date of Contract except when required due to unforeseen circumstances.
- B. Within a period of thirty (30) days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified, when submitted in accordance with the requirements stipulated herein.
- C. One or more of the following conditions must be documented in any such request:
  - 1. Required for compliance with final interpretation of code or insurance requirements.
  - 2. Required due to unavailability of a specified product.
  - 3. Required because of the inability of the specified product to perform properly or to fit in the designated space.
  - 4. Substitution would be substantially in the best interest of the Owner in terms of cost, time, or other considerations.

### **1.06 SUBSTITUTIONS NOT PERMITTED**

- A. If implied on submittals without first requesting approval thereof.
- B. If acceptance will require substantial revision of the Contract Documents.

**END OF SECTION**

SUBSTITUTION REQUEST FORM

TO: \_\_\_\_\_

PROJECT: \_\_\_\_\_

SPECIFIED ITEM:

Section	Page	Paragraph	Description
---------	------	-----------	-------------

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

Signature \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

Date \_\_\_\_\_

Telephone \_\_\_\_\_

Attachments:

For use by Design Consultant:

Accepted  Accepted as noted

Not Accepted  Received too late

By \_\_\_\_\_

Date \_\_\_\_\_

Remarks \_\_\_\_\_

## SECTION 01 31 19

### PROJECT MEETINGS

#### PART 1 GENERAL

##### 1.01 PRE-CONSTRUCTION MEETING

- A. Architect/Engineer/Designer, Contractor and Owner will meet prior to start of the Work (within seven (7) days after notice to proceed) to discuss at least the following topics and any others of mutual interest.
1. Schedule of Values
  2. Permit Status/tree protection/erosion control
  3. List of sub-contractors
  4. Job inspections.
  5. Early purchase of, and/or lead time requirements for material and equipment/repurchase of equipment
  6. Monthly payment date/SOP for pay requests
  7. Portion of site to be occupied by construction.
  8. Parking/Staging areas
  9. Non-smoking campus requirements
  10. Maintenance of access and safety.
  11. Processing of field decisions and change orders
  12. Labor provisions/labor rates for subs
  13. Material submittals/deferred submittals
  14. Owner access during construction.
  15. Review of Contract Documents/review ADA requirements/cross-slopes
  16. Coordination procedures and separate contracts.
  17. Progress schedules.
  18. Critical Work sequencing.
  19. Safety and emergency procedures/24 hour contact numbers
  20. Security procedures.
  21. Hazardous materials.
  22. Progress meetings.
  23. Contract close-out.
- B. Location of Meeting: Project site

##### 1.02 PROGRESS MEETINGS

- A. The Contractor will schedule and administer progress meetings and will:
1. Prepare agendas.
  2. Schedule progress meetings, frequency, time and day to be determined during pre-construction meeting.
  3. Make physical arrangements for and preside at meetings.
  4. Record minutes and include decisions.
  5. Distribute copies of minutes to participants within four (4) days after meetings.

- B. Location of Meetings: Project site.
- C. Attendance:
  - 1. The Owner or Owner's Authorized Representative.
  - 2. Contractor.
  - 3. Subcontractors affected by agenda.
  - 4. Project Architect/Engineer/as necessary.
  - 5. Owner will attend meeting to ascertain Work is expedited consistent with progress schedule and with Contract Documents.
- D. Minimum Agenda:
  - 1. Review and approve minutes from previous meeting.
  - 2. Review Work progress since previous meeting.
  - 3. Discuss field observations, and problems.
  - 4. Review delivery schedules, construction schedule, and identify problems which impede planned progress.
  - 5. Review proposed changes.
  - 6. Material submittals.
  - 7. Note all new subcontractors performing Work at the job site.

**END OF SECTION**

## **SECTION 01 33 23**

### **SHOP DRAWINGS, PRODUCT DATA, SAMPLES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Submit to the Owner shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.
- B. Related Work Specified Elsewhere
  - 1. Instructions to Bidders.
  - 2. OSU General Conditions.

##### **1.02 SUBMITTAL SCHEDULING**

- A. For items requiring review by the Owner only, submittals shall be sent to the Owner at least 15 calendar days before the date each is required for fabrication or installation.
- B. Submittals to be reviewed by Owner's consultants shall be sent to the Owner at least 20 calendar days before the date each is required for fabrication or installation.
- C. Submittals to be reviewed by Owner's property insurance carrier shall be sent to Owner as directed in individual specification sections.
- D. Submittals involving Substitution requests or other modifications requiring review by the Owner and/or the Owner's consultants shall be sent to the Owner at least 20 calendar days before the date each is required for fabrication or installation.

##### **1.03 SUBMITTAL CONTENT AND FORMAT**

- A. General Requirements:
  - 1. Shop Drawings: Submit in electronic format and, if requested by Owner's Authorized Representative, submit one reproducible transparency and 1 print of each drawing.
  - 2. Product Data: Submit electronically, and if requested by Owner's Authorized Representative, up to 6 hard copies.
  - 3. Samples: Submit the number and type stated in each Specification Section. Submit a minimum of three sets of color samples where color selection is required.
  - 4. Submittals shall include:
    - a. Date and revision dates return date requested.
    - b. Project title and number.
    - c. The names of the Contractor, subcontractor, supplier, and manufacturer.
    - d. Identification of product or material, with Specification Section number.

- e. Relation to adjacent critical features of work or materials.
  - f. Field dimensions, clearly identified as such.
  - g. Applicable standards, such as ASTM number or Federal Specification.
  - h. Identification of deviations from Contract Documents, and for products accompanied by Substitution request as required by Section 01 25 00.
  - i. Contractor's stamp legibly signed, essentially as follows:
    - 1) The undersigned, acting on behalf of the Contractor, certifies that this submittal has been reviewed and is approved; products have been verified as being as specified, field measurements and field construction criteria have been or will be coordinated, and the submittal is in compliance with Contract Documents.
5. Re-submission Requirements:
- a. Revise initial drawings as required and resubmit as specified for initial submittal.
  - b. Indicate on drawings any changes which have been made other than those requested by the Owner or the owner's consultants.
6. The Owner may return without review any submittal not meeting the requirements listed above.
- B. Shop Drawings:
- 1. Present data in a clear and thorough manner.
  - 2. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Documents.
  - 3. Structural items shall be identified by location in the completed structure. Identify details by reference to contract sheet and detail numbers.
  - 4. Minimum sheet Size: 8 ½ x 11".
- C. Product Data:
- 1. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:
    - a. Clearly mark each copy to identify pertinent product or models.
    - b. Show dimensions, weights, and clearances required.
    - c. Show performance data consisting of capabilities, ROM, KW, pressure drops, design characteristics and consumption; conforming as closely as possible to the test methods referenced in the Plans and Specifications.
    - d. Show wiring or piping diagrams and controls.
  - 2. Manufacturer's standard schematic drawings and diagrams:
    - a. Modify to delete information which is not applicable.
    - b. Supplement standard information to provide information specifically applicable to the Work.
- D. Samples:
- 1. Insure that samples are of sufficient size to indicate the general visual effect or color.
  - 2. Where samples must show a range of color, texture, finish, graining, or

- other property, submit sets of pairs illustrating the full scope of this range.
3. One (1) sample or one (1) set of approved samples will be retained by the Owner; final work will be measured against approved samples.

#### **1.04 QUALITY ASSURANCE**

- A. Process submittals in ample time for review, as applicable, so as to not delay the Work. All submittals shall be received by the Owner within ten (10) days after pre-construction.

#### **1.05 DEFINITIONS**

- A. The Owner will mark reviewed materials as follows:
  1. "No Exception Taken," which means fabrication, manufacture and/or installation may proceed.
  2. "Make Revisions Noted," which means fabrication, manufacture and/or installation may proceed with revisions as noted.
  3. "Revise and Resubmit," which means that fabrication, manufacture and/or installation may not proceed.
  4. "Rejected," which means do not proceed; make arrangements for the review of the proposed Work with the Owner as soon as possible.

#### **1.06 PROCESSING**

- A. Review submittals, make necessary corrections, and become familiar with the content of the submittals.
- B. Mark each item with Contractor's stamp.
- C. Accompany submittals with a transmittal letter bearing the project name, Contractor's name, number of items, and other pertinent data.
- D. Keep one copy of each reviewed submittal on the job site at all times.
- E. Be responsible for obtaining and distributing prints of shop drawings to the various suppliers, and the Owner once review process has been completed. Make prints of reviewed shop drawings only from transparencies which carry the appropriate stamp and endorsement.

**END OF SECTION**





**SECTION 01 42 13****ABBREVIATIONS AND SYMBOLS****PART 1 GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

A/C	air conditioning	CF	cubic foot
AB	anchor bolt	CFOI	contractor furnished owner installed
AC	asphaltic concrete	CG	corner guard
ACT	acoustical tile	CH	ceiling height
AD	area drain	CI	cast iron
ADD	addendum	CJ	control joint
ADD'L	additional	CKBD	chalkboard
ADH	adhesive	CL	centerline
AFF	above finish floor	CLG	ceiling
AGG	aggregate	CLR	clear(ance)
AL	aluminum	CM	construction manager
ALLOW	allowable	CMT	ceramic mosaic (tile)
ALT	alternate	CMU	concrete masonry unit
ANOD	anodized	COL	column
AP	access panel	COM	communications
APPRX	approximate	CONC	concrete
ARCH	architect(ural)	CONN	connect(ion)
ASPH	asphalt	CONST	construction
AUTO	automatic	CONT	continuous or continue
AVE	avenue	CONTR	contract(or)
		CPT	carpet
BD	board	CRS	course(s)
BIT	bituminous	CS	countersink
BLDG	building	CSMT	casement
BLKG	blocking	CT	ceramic tile
BM	bench mark, beam(s)	CTR	center
BOT	bottom	CVG	clear vertical grain
BRZ	bronze	CW	cold water
BS	both side	CWT	ceramic wall tile
		CY	cubic yard
CB	catch basin		
CEM	cement	D	depth

DEMO	demolish, demolition	FAS	fasten, fastener
DEP	depressed	FBD	fiberboard
DF	drinking fountain	FBT	finished blowing temperature
DIA	diameter	FD	floor drain, fire damper
DIAG	diagonal	FE	fire extinguisher
DIM	dimension	FEC	fire extinguisher cabinet
DISP	dispenser	FF	factory finish
DIV	division	FGL	fiberglass
DL	dead load	FHMS	flathead machine screw
DMT	demountable	FHWS	flathead wood screw
DN	down	FIN	finish(ed)
DP	dampproofing	FLCO	floor cleanout
DR	door	FLR	floor(ing)
DS	downspout	FLUR	fluorescent
DT	drain tile	FND	foundation
DTL	detail	FOC	face of concrete
DW	dumbwaiter	FOIC	furnished by owner/installed by contractor
DWG	drawing(s)	FOIO	furnished by owner/installed by owner
DWR	drawer	FOM	face of masonry
EA	each	FP	fireproofing, flash point
EB	expansion bolt	FPHB	freeze-proof hose bib
EF	each face	FR	fire resistive, fire rated
EJ	expansion joint	FRM	frame(d), (ing)
EL	elevation	FS	full size
ELEC	electric(al)	FSS	finished structural slab
EMBED	embedment	FT	foot
EMER	emergency	FTG	footing
ENCL	enclose(ure)	FTS	finished topping slab
EP	electrical panel board	GA	gage, gauge
EQ	equal	GALV	galvanized
EQUIP	equipment	GB	grab bar or gypsum board
EST	estimate	GC	general contractor
EVT	equiviscous temperature	GI	galvanized iron
EW	each way	GL	glass, glazing
EWC	electric water cooler	GLS	glass resin wall surfacing
EX.EXIT	existing	GP	gypsum
EXH	exhaust	HB	hose bib
EXP	exposed	HBD	hardboard
EXT	exterior	HC	hollow core
FA	fire alarm	HD	heavy duty
FAF	fluid applied flooring		
FARF	fluid applied resilient floor		

HDR	header	MFR	manufacture(r)
HDW	hardware	MH	manhole
HM	hollow metal	Min	minimum, minute
HOR	horizontal	MISC	miscellaneous
HP	high point	MO	masonry opening
HR	hour	MO#	model number
HT	height	MOD	modular
HTG	heating	MPH	miles per hour
HVAC	heating, ventilating, air conditioning	MS	machine screw
HWD	hardwood	MTL	metal
HWH	hot water heater	MULL	mullion
		MWP	membrane waterproofing
ID	inside diameter, identification	NAT	natural, natural finish
IN	inch	NIC	not in contract
INCIN	incinerator	NO	number
INCL	include(d), ion)	NOM	nominal
INT	interior	NTS	not to scale
INV	invert		
		OA	overall
JB	junction box	OBS	obscure
JC	janitor's closet	OC	on center(s)
JT	joint	OD	outside diameter
		OF	overflow
KD	kiln dried	OFCI	owner furnished contractor installed
KCP	Keene's cement plaster	OFOI	owner furnished owner installed
KO	knockout		
KP	kick plate	OHMS	ovalhead machine screw
		OHWS	ovalhead wood screw
LAB	laboratory	OPG	opening
		OPP	opposite
LAM	laminate(d)	OZ	ounce(s)
LAV	lavatory		
LBS	pounds	P	paint(ed)
		PB	push button
LH	left hand	PCF	pounds per cubic foot
LL	live load	PCP	putting coat plaster
LONGIT	longitudinal	PERF	perforate(d)
LP	low point	PL	plate, property line
LW	lightweight	PLAM	plastic laminate
		PLAS	plaster
MAX	maximum	PNL	panel
MB	machine bolt	PP	push plate
M. MECH	mechanic(al)		

PR	pair	STR	structural
PREP	prepare	SUPP	supplement
PSF	pounds per square foot	SUPT	support
PSI	pounds per square inch	SUSP	suspended
PT	point, pressure treated	SV	sheet vinyl
PTN	partition		
PVC	polyvinyl chloride	T	tread
PWD	plywood	TBM	top bench mark
		T&G	tongue and groove
QT	quarry tile	TB	towel bar
		TC	top of curb
R	rise	TEL	telephone
RA	return air	TEMP	tempered
RAD	radius	THK	thickness
RCP	reflected ceiling plan	TKBD	tackboard
RD	roof drain	TO	top of
REF	reference	TP	top of paving
REFR	refrigerator	TRANS	transverse
REINF	reinforce(ing)	TS	top of slab
REQ	required	TV	television
RET'G	retaining	TW	top of wall
REV	revision(s), revised	TYP	typical
RH	right had		
RM	room	UNO	unless noted otherwise
RO	rough opening		
RSF	resilient sheet flooring	VAT	vinyl asbestos tile
		VB	vapor barrier
SC	solid core	VCT	Vinyl Composition Tile
SCHED	schedule	VERT	vertical
SEC	section	VG	vertical grain
SF	square feet (foot)	VIF	verify in field
SHT	sheet	VWC	vinyl wall covering
SHTHG	sheathing		
SIM	similar	W	width, wide, water
SL	sleeve	W/	with
SOG	slab on grade	W/O	without
SPEC	specification(s)	WC	water closet
SQ	square	WD	wood, wood finish
SS	storm sewer	WP	waterproof(ing)
S4S	finished 4 sides	WNS	wainscot
SD	storm drain	WR	water resistant
ST	steel, street	WS	waterstop
ST ST	stainless steel	WW	window wall
STD	standard	WWC	wood wall covering

WWF woven wire fabric

B. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

&	and
$\lambda$	angle
@	at
$\varnothing$	diameter, round
"	inches
:	is, shall b
'	feet
$\zeta$	perpendicular
/	per
%	percent
#	pound, number
X	by (as in 2 by 4)

**END OF SECTION**





## SECTION 01 42 16

### DEFINITIONS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Words which may be found elsewhere in the Contract Documents are defined in accordance with the standards set forth in the following table:

**Approve:**

Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be limited to the Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contract requirements.

**As Detailed, As Shown:**

Where "as detailed", "as shown" or words of similar importance are used, it shall be understood that reference to the Drawings accompanying the Specifications is made unless otherwise stated.

**As Directed, As Required, As Authorized, As Reviewed, As Accepted:**

Where "as directed", "as required", "as authorized", "as reviewed", "as accepted" or words of similar importance are used, it shall be understood that the direction, requirement, permission, authorization, review, or acceptance of the Architect is intended, unless otherwise stated.

**As Indicated:**

Where "as indicated" is used it shall be understood that reference to Drawings and/or Specifications is made unless otherwise stated.

**Directed, Requested, etc.:**

Terms such as "directed," "requested," "authorized," "selected," will be understood as "directed by Architect," "requested by Architect," and similar phrases shall not be interpreted to extend Architect's responsibility into Contractor's responsibility for construction supervision.

**Furnish:**

Except as otherwise defined in greater detail the term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

**Indicated:**

The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specifications

and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference and no limitation of location is intended except as specifically noted.

**Install:**

Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

**Installer:**

The term "installer" is defined as the entity (person or firm) engaged by Contractor, or its subcontractor or sub-subcontractor for performance of a particular unit of Work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

**Provide:**

Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

**END OF SECTION**

**SECTION 01 42 19****REFERENCE STANDARDS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Quality Assurance.
- B. Location of References.
- C. Schedule of References.

**1.02 QUALITY ASSURANCE**

- A. For products or quality of work specified by association, trade, or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents.
- C. General Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable standards of the construction industry have the same force and effect as if bound or copied directly into Contract Documents.
- D. Such standards are made a part of the Contract Documents by reference.
- E. Individual sections indicate which codes and standards the Contractor must keep at the project site, available for reference.
- F. Referenced industry standards take precedence over standards which are not referenced but recognized in industry as applicable.
- G. Non-referenced standards are not directly applicable to the Work, except as a general requirement of whether the Work complies with standards recognized in the construction industry.

**1.03 LOCATION OF REFERENCES**

- A. Valley Library, Oregon State University.

**1.04 SCHEDULE OF REFERENCED ASSOCIATIONS**

AIA            American Institute of Architects  
                  WWW.AIA.ORG

AISC	American Institute of Steel Construction <a href="http://WWW.AISC.ORG">WWW.AISC.ORG</a>
AISI	American Iron and Steel Institute <a href="http://WWW.STEEL.ORG">WWW.STEEL.ORG</a>
ANSI	American National Standards Institute <a href="http://WWW.ANSI.ORG">WWW.ANSI.ORG</a>
APA	American Plywood Association <a href="http://WWW.APAWOOD.ORG">WWW.APAWOOD.ORG</a>
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers <a href="http://WWW.ASHRAE.ORG">WWW.ASHRAE.ORG</a>
ASTM	American Society for Testing and Materials <a href="http://WWW.ASTM.ORG">WWW.ASTM.ORG</a>
AWPA	American Wood Protection Association <a href="http://WWW.AWPA.COM">WWW.AWPA.COM</a>
AWS	American Welding Society <a href="http://WWW.AWS.ORG">WWW.AWS.ORG</a>
BIA	Masonry Institute of America <a href="http://WWW.MASONRYINSTITUTE.ORG">WWW.MASONRYINSTITUTE.ORG</a>
BOLI	Oregon Bureau of Labor and Industries <a href="http://WWW.BOLI.STATE.OR.US">WWW.BOLI.STATE.OR.US</a>
CCB	Construction Contractors Board <a href="http://WWW.OREGON.GOV.CCB/">WWW.OREGON.GOV.CCB/</a>
CDA	Copper Development Association <a href="http://WWW.COPPER.ORG">WWW.COPPER.ORG</a>
CISPI	Cast Iron Soil Pipe Institute <a href="http://WWW.CISPI.ORG">WWW.CISPI.ORG</a>
CSI	Construction Specification Institute <a href="http://WWW.CSINET.ORG">WWW.CSINET.ORG</a>
DEQ	Department of Environmental Quality (Oregon) <a href="http://WWW.OREGON.GOV/DEQ/">WWW.OREGON.GOV/DEQ/</a>
DHI	Door and Hardware Institute

	WWW.DHI.ORG
DOT	Department of Transportation WWW.DOT.GOV
EPA	U.S. Environmental Protection Agency WWW.EPA.GOV
FM	Factory Mutual System WWW.FMGLOBAL.COM
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) WWW.GSA.GOV/PORTAL/CONTENT/103856
IBC	International Building Code WWW.ICCSAFE.ORG
ICBO	International Conference of Building Officials PUBLICECODES.CITATION.COM/ICOD/IBG/INDEX.HTM
IRS	Internal Revenue Service WWW.IRS.GOV
ISA	Instrumentation Systems and Automation Society WWW.ISA.ORG
NAAMM	National Association of Architectural Metal Manufacturers WWW.NAAMM.ORG
NBFU	National Board of Fire Underwriters WWW.NFPA.ORG
NEC	National Electric Code WWW.NECPLUS.ORG
NEMA	National Electrical Manufacturers' Association WWW.NEMA.ORG
NESC	National Electrical Safety Code WWW.IEEE.ORG
NFPA	National Fire Protection Association WWW.NFPA.ORG
NRCA	National Roofing Contractors' Association WWW.NRCA.NET

OAR	Oregon Administrative Rules ARCWEB.SOS.STATE.OR.US/404.HTML
OESP	State of Oregon Electrical Specialty Code <a href="http://www.bcd.oregon.gov/programs/online_codes.html">http://www.bcd.oregon.gov/programs/online_codes.html</a>
ORS	Oregon Revised Statutes LANDRU.LEG.STATE.OR.US/ORS/
OSHA	Occupational Safety and Health Administration WWW.OSHA.GOV
OSSC	Oregon Structural Specialty Code <a href="http://www.bcd.oregon.gov/programs/online_codes.html">http://www.bcd.oregon.gov/programs/online_codes.html</a>
PS	Product Standard STANDARDS.GOV/STANDARDS.CFM
SDI	Steel Door Institute WWW.STEELDOOR.ORG
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association WWW.SMACNA.ORG
SPRI	Single Ply Roofing Institute WWW.SPRI.ORG
SSPC	Steel Structures Painting Council WWW.SSPC.ORG
SWRI	Sealing, Waterproofing and Restoration Institute WWW.SWIRONLINE.ORG
UBC	Uniform Building Code (See ICBO)
UFC	Uniform Fire Code WWW.NFPA.ORG
UL	Underwriters' Laboratories, Inc. WWW.UL.COM
UMC	Uniform Mechanical Code WWW.UBC.COM
UPC	Uniform Plumbing Code WWW.UBC.COM
WHL	Warnock Hersey Laboratories

WWW.INTEK.COM/MARKS/WH/

WCLIB West Coast Lumber Inspection Bureau  
WWW.WCLIB.ORG

WWPA Western Wood Products Association  
[WWW.WWPA.ORG](http://WWW.WWPA.ORG)

**END OF SECTION**





## **SECTION 01 45 00**

### **QUALITY CONTROL**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Codes, regulations and permits.
- B. Procedures for quality control.

##### **1.02 OWNER RESPONSIBILITIES**

- A. Owner will employ and pay for services of an independent testing laboratory to perform inspection, sampling and testing as required by local building authority.
- B. Owner's Authorized Representative will provide on-site observation during construction.

##### **1.03 CODES, REGULATIONS AND PERMITS**

- A. All Work shall conform with the Oregon Structural Specialty Code (OSSC) based on the International Building Code (IBC), as amended by the State of Oregon Building Codes Division and the edition designated by the governing authority.
- B. Contractor shall comply with all applicable state and local construction codes.
- C. References to codes, Specifications and standards referred to in the Contract Documents shall mean, and are intended to be, the latest edition, amendment or revision of such reference standard in effect as of the date of these Contract Documents.
- D. The Owner shall be responsible for all permits and City of Corvallis plan review fees; the Contractor shall be responsible for all licenses and associated fees required for the Project.
- E. Contractor shall arrange and attend all required permit inspections and furnish evidence of approved City inspection reports per Section 01 77 00.

##### **1.04 QUALITY OF WORK**

- A. It is the true and specific intent of these Specifications that quality of Work on all phases of the construction and embracing all the trade sections shall be of high quality performed by workers skilled in their trade and performing their Work only according to the standard of best practice of the trade.
- B. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with manufacturer's directions unless otherwise specified.
- C. If Work is required in a manner to make it impossible to produce first quality Work, or should discrepancies appear among Contract Documents, request interpretation from Architect before proceeding with Work.

- D. Failure to secure interpretation may cause rejection by Architect or owner of installation.

#### **1.05 LAYOUT**

- A. Be responsible for properly laying out the Work and for lines and measurements for the Work.
- B. Verify the figures shown on the drawings before laying out the Work and report errors or inaccuracies to the Architect before commencing Work.
- C. Strict compliance with maximum slopes is required. Accessible parking spaces and adjacent access aisles with slope exceeding 2% in any direction, as determined by OSU, shall be removed and replaced by the contractor at their expense.
- D. Strict compliance with maximum slopes is required. New sidewalks exceeding 1:20 slope or with cross slope exceeding 2%, as determined by OSU, shall be removed and replaced by the contractor at their expense. Ramps exceeding 1:16 slope or with cross slope exceeding 2%, as determined by OSU, shall be removed and replaced by the contractor at their expense.

#### **1.06 SUPERVISION**

- A. The Contractor shall maintain effective supervision on the project at all times Work is being performed.
- B. The superintendent shall be the same person throughout the project and shall attend the preconstruction conference.

#### **1.07 INSPECTIONS AND TESTING**

- A. Contractor shall notify the Owner at least twenty-four (24) hours in advance of any required progress inspection or final inspection including final punch list inspection.
- B. Cooperate with laboratory personnel, provide access to Work and furnish incidental equipment material and labor required for field testing and sample taking.

#### **1.08 EVALUATION OF TESTS AND INSPECTIONS**

- A. Results of laboratory and/or field control tests and inspections shall be the principal basis upon which satisfactory completion of Work shall be judged.
- B. If results of tests and inspections indicate Work is below requirements of Contract Documents, that portion of Work is subject to rejection.

#### **1.09 ADJUSTMENTS**

- A. Remove and replace Work so rejected at Contractor's expense including costs of subsequent tests and inspections until Work meets requirements of Contract Documents.

- B. The Owner reserves the right to perform any testing as may be required to determine compliance with the Contract Documents.
- C. Costs for such testing will be the Owner's responsibility unless testing indicates noncompliance. Cost for such testing indicating noncompliance shall be borne by the Contractor.
- D. Noncomplying Work shall be corrected and testing will be repeated until the Work complies with the Contract Documents.
- E. Contractor will pay costs for retesting noncomplying Work.

**END OF SECTION**

## SECTION 01 51 00

### CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

##### 1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition".
- C. Electrical Service: Comply with NEMA, NEC and UL standards and regulations for temporary electric service; install service in compliance with National Electric Code (NFPA 70).
- D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use; obtain required certifications and permits if required.

##### 1.03 PROTECTION

- A. Protect sidewalks, asphalt paving, concrete, trees, shrubs, and lawn areas at all times from damage resulting from construction activities.
- B. Prevent materials from clogging catch basins and yard drains; leave drains clean and in proper working condition.
- C. Protect Existing Irrigation Systems:
  - 1. In the event damage occurs to an underground irrigation system as a direct result of a Contractor's activities, the Contractor shall repair/replace or be assessed a charge at the discretion of the Owner.
  - 2. If repairs are to be made by the Contractor, the repairs will be inspected by the Owner's Authorized Representative prior to backfilling.
  - 3. Any galvanized pipe that requires repair shall be repaired at a threaded coupling, not by use of a compression coupling.
- D. Protect Existing Air Handling Systems:
  - 1. Contractor shall be responsible for protection of the cleanliness of the existing air handling system at all times. This protection shall include:
    - a. During site work or building demolition, prefilters shall be provided and maintained on all building outside air intakes at all times throughout the construction duration.
    - b. During any interior work that may create dust in the interior space and

adjacent corridor/hallways, air filters shall be provided and maintained on all affected air return and exhaust grilles. Where air flow in or out of the space is not required, all air duct openings shall be temporarily blanked off with plywood or sheet metal.

- c. Prior to starting any work, the Contractor shall record and submit to the Owner's Authorized Representative, pressure readings across all existing air handler air filter banks before installation of new prefilters.
  - d. Upon completion of all Work affecting existing air handling systems, the Contractor shall remove all temporary filters, covers and associated parts and restore the system to its original operating condition unless otherwise stated elsewhere in the Contract Documents
- E. Clean, repair, resurface, or restore existing surfaces to their original, or better, condition, or completely replace such surfaces to match existing, where damaged by construction operations.
- F. Security is the responsibility of the Contractor.
- G. Construction Debris:
- 1. Debris shall not be allowed to remain around the buildings during performance of Work, but shall be disposed of as rapidly as it accumulates.
  - 2. On completion of Work, the buildings and grounds shall be left in a condition that is equal to or better than original condition.
  - 3. In case of failure to do so, the Owner may remove rubbish and charge the cost to the Contractor.
- H. The Contractor shall manage a safe job environment for both the safety of all the people around the Work site as well as the safety of the Owner's and general public's property.
- I. The Contractor shall provide and maintain suitable barricades, shelters, lights, and danger signals during the progress of the Work; they shall meet the requirements of the local building code and OSHA.

#### **1.04 DRAINAGE**

- A. Verify that all rain drains in the construction areas are in working order and notify the Owner's Authorized Representative in writing of any rain drains that are plugged, prior to the start of the Work.
- B. Start of Work will be considered as acknowledgment that all drains are clear and in good working order.
- C. All drains shall be left in a clean and proper working condition.

#### **1.05 CONSTRUCTION PROJECT SAFETY FORM**

- A. Contractor shall submit to the Owner, prior to signing the Contract, the completed "Construction Project Safety Form", which is provided with instructions at the end of this Section.

## 1.06 TEMPORARY UTILITIES

- A. Temporary Utilities:
  - 1. Prepare a schedule indicating dates for implementation and termination of each temporary utility.
  - 2. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.
- B. Conditions of Use:
  - 1. Keep temporary services and facilities clean and neat in appearance.
  - 2. Operate in a safe and efficient manner.
  - 3. Take necessary fire prevention measures.
  - 4. Do not overload facilities or permit them to interfere with progress.
  - 5. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- C. Electrical Service:
  - 1. Service limited to 20 amp 120V circuits will be paid for by the Owner.
  - 2. Connection to the service shall be the responsibility of the Contractor, with the Owner's approval.
  - 3. Coordinate with the Owner's Authorized Representative.
- D. Water Service:
  - 1. Service in reasonable quantities for the Project will be paid for by the Owner.
  - 2. Connection to the service shall be the responsibility of the Contractor, with the Owner's approval.
  - 3. Coordinate with the Owner's Authorized Representative.

## 1.07 TEMPORARY SUPPORT FACILITIES

- A. Temporary Sanitary Facilities:
  - 1. Provide and maintain an adequate number of facilities for the use of all persons employed on the Work during construction.
  - 2. Provide enclosed, weatherproof facilities with heat as required.
  - 3. Use of new or existing Owner's facilities will not be permitted.
- B. Temporary Heat and Ventilation:
  - 1. As necessary, provide temporary heat and ventilation required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- C. Telephone Equipment: Provide telephone communications at project site.
- D. Existing Services:
  - 1. Do not interrupt any existing service.

2. Prior request and approval of the Owner's Representative will enable the Owner to shut down any utility required by the Work.
3. Contractor shall not shut down utilities.

#### **1.08 TEMPORARY BARRIERS AND ENCLOSURES**

- A. Provide barriers and fencing to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.
- B. Provide Commercial grade chain link fence construction.
- C. Provide 6 foot high fence around construction site as directed by Owner's Authorized Representative; equip with vehicular and pedestrian gates with lock.
- D. Exterior Closures: Provide temporary secured, weather-tight closures at exterior openings, to permit acceptable working conditions and protection of the Work.
- E. Interior Closures:
  1. Provide temporary floor to ceiling partitions (not plastic sheeting) and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, to reduce construction noise, and to prevent damage to existing materials and equipment.
  2. Paint surfaces exposed to view from Owner occupied areas.

#### **1.09 ODORS**

- A. Work that causes excessive odors shall be performed only after coordination with the Owner's Authorized Representative. Filtering of air intakes to units may be required to prevent odors and vapors from entering the buildings.
- B. Contractor shall provide 7 days advance notice to the Owner's Authorized Representative in order for advance notice to be forwarded to building occupants. Work stoppage may occur if advance notification has not been coordinated or odors and vapors from the work are found to generate complaints from building occupants.

#### **1.10 FIRE SAFETY**

- A. Ensure that required exit routes remain unobstructed while building is occupied.
- B. Abide by all fire safety requirements for buildings under construction, alteration or demolition as required by Article 87, of the Uniform Fire Code as adopted by the State of Oregon.
- C. An emergency telephone shall be provided on site. Cellular telephone equipment is acceptable.
- D. Fire Suppression Equipment:
  1. Install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and

Demolition Operations".

2. Maintain equipment in working condition with current inspection certificate attached to each.
3. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
4. Store combustible materials in containers in fire-safe locations.
5. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
- 6.
6. Provide continual supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
7. When possible, relocate hot work to a designated hot work area.
8. If the materials or equipment cannot be relocated to a designated hot work area, use the least hazardous form of hot work that will get the job done and prepare the area properly.
9. Manage mobile hot work using the formal hot work permit system. (mentioned in the next bullet point and also a directive in the OSU Hot Work Safety Program)
10. Make sure both fire protection and hot work equipment work properly.
11. Train all personnel involved in hot work operations and activities so that they have the understanding, knowledge, and skills necessary to safely perform their jobs.

### **1.11 CONSTRUCTION AIDS**

- A. Scaffolding: comply with applicable OSHA requirements.
- B. Material Handling Equipment:
  1. Provide necessary cranes, hoists, towers, or other lifting devices.
  2. Use only experienced operators.
  3. Remove equipment as soon as possible after task is ended.
  4. Coordinate placement of such equipment with Owner's Authorized Representative.
  5. Obtain required permits and meet requirement of governing authorities regarding applicable regulations.
- C. Materials or debris shall not be allowed to free fall from building.
- D. The use of chutes or conveyors must be approved by Owner.

### **1.12 TEMPORARY CONTROLS**

- A. Water Control:
  1. Maintain excavations free of water.
  2. Provide, operate, and maintain necessary pumping equipment.
- B. Protection:
  1. Protect installed Work and provide special protection where specified in individual specification sections.

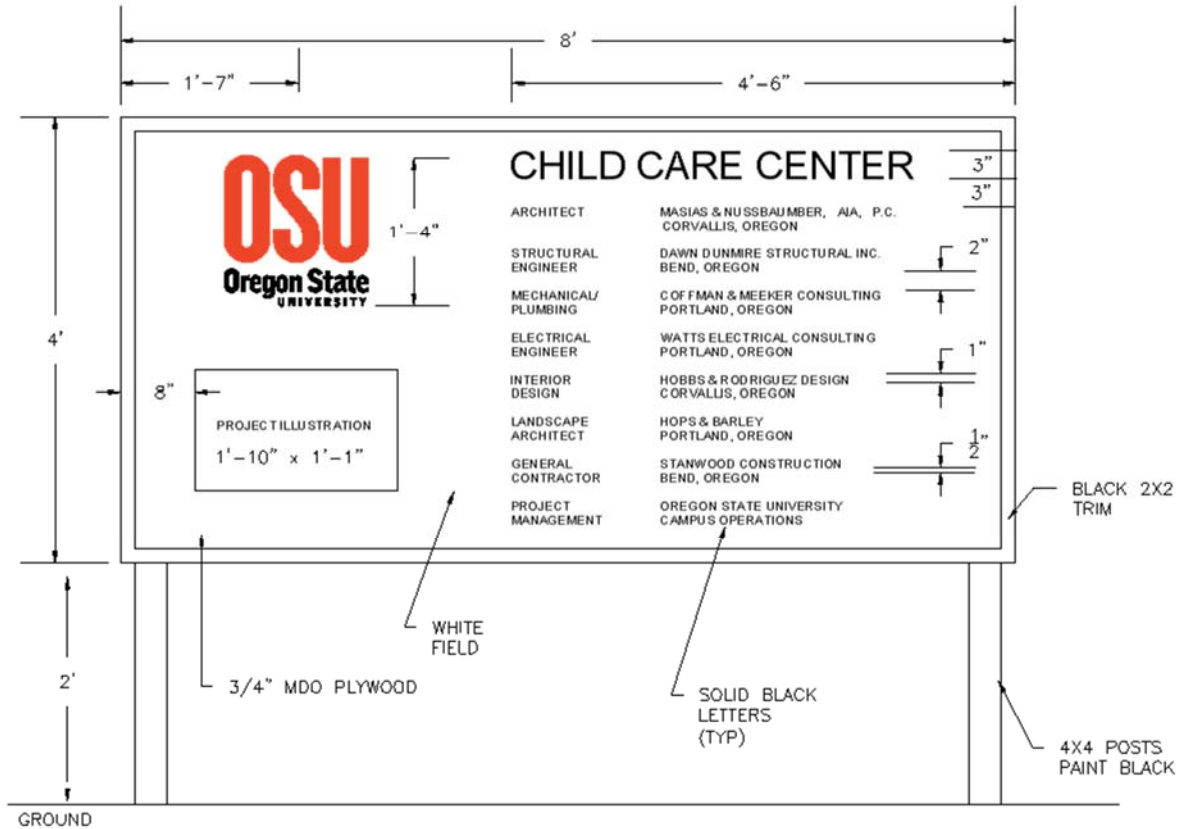


2. Prohibit traffic or storage upon waterproofed or roofed surfaces.
- C. Security:
1. Provide security and facilities to protect Work and existing facilities and Owner's operations from unauthorized entry, vandalism, or theft.
  2. Coordinate operations with Owner's Authorized Representative.
- D. Temporary Traffic Control /Pedestrian Accessibility
1. A continuous route for all pedestrians, including persons with disabilities and bicyclists, shall be maintained at all times. When existing pedestrian facilities are disrupted, closed, or relocated in a construction zone, temporary pedestrian facilities shall be provided.
  2. Temporary pedestrian facilities should be safe and accessible. There should be no curbs or abrupt changes in grade that could cause tripping or be a barrier to wheelchair use.
  3. Signage shall be provided directing people to the temporary accessible route. The signage shall include the International Symbol of Accessibility.
  4. Contractors shall not block temporary walkways with vehicles, equipment, construction materials, signs, trash, or other objects that might prohibit pedestrian passage.
  5. Construction equipment and equipment operation must be separated from any open walkways. At construction zones, pedestrian fences or other protective barriers shall be provided to prevent access into the construction zone.

### **1.13 PROJECT SIGNAGE**

- A. Contractor is permitted to post only one project identification sign based on the following example:

## OSU TYPICAL JOB SIGN



### 1.14 PREPARATION

- A. Consult with Owner to review jobsite areas required for field offices, material storage and stockpiles, equipment storage, access to different locations, etc.

### 1.15 PERFORMANCE

- A. Confine equipment, apparatus, and storage of material to work limits. The Owner will not be responsible for protection of materials and equipment from damage, pilfering, etc.
- B. Install temporary facilities in such a manner that the installed work will not be damaged.
- C. Do not use facilities of existing building unless authorized in writing by the Owner.
- D. Effective September 1, 2012, OSU became a non-smoking campus and smoking is prohibited on all Campus property.
- E. Keep facilities well maintained.
- F. Relocate temporary facilities as required during job progress.

- G. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:
1. Replace air filters and clean inside of ductwork and housings.
  2. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
  3. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

**END OF SECTION**

# Oregon State University Construction and Maintenance Safety Requirements

EH&S, 130 Oak Creek Building, Corvallis, OR 97331-7405, (541) 737-2505,  
FAX (541) 737-9090

**Complete OSU Construction and Maintenance Safety Form** - Send completed documents (including Site Safety Plan and all separate answer pages) to Construction Contract Administration along with the signed contract and bonds.

**Project Isolation** - All construction and remodeling activities regardless of size and/or scope must be fenced, barricaded, or otherwise protected to restrict entrance and to ensure the safety of those in the general area. See isolation requirements.

**Site Safety Plan** - A site safety plan will be required and will address:

- General Information
- Emergency Information
- Key Organization Personnel
- Hazard Evaluation/Facility Impact
- Emergency Procedures
- Work Zones
- Security Measures
- Fire Protection

A model plan is attached. This form can be used if another plan has not already been prepared. Contact OSU Environmental Health & Safety for more information 737-2505.

## Isolation Requirements

**General:** All construction, maintenance, and remodeling activities, regardless of size or scope, must be fenced, barricaded, or otherwise isolated to restrict entrance and to ensure the safety of those in the general area.

**Outdoor Activities:** Outdoor projects require the following perimeter isolation:

- A six foot chain-link fence, with controlled access points, extending in all directions around the excavation or building site such that no area of the construction is accessible to pedestrians or unauthorized personnel or vehicles.
- Isolation area will include vehicle loading and unloading areas.
- At the University's option, other barricading plans may be accepted. These may apply to projects such as road resurfacing, parking lot striping, exterior building water proofing, deliveries, etc. Contact EH&S regarding other barricading plans.

**Overnight:** Any excavation across or adjacent to sidewalks or pathways which must be left open overnight, must be identified with working, blinking construction lights in addition to solid barricades

**Indoor Activities:** Indoor construction or maintenance projects which will create dust, potentially hazardous fumes or vapors, or offensive odors are subject to the following isolation:

- Areas where existing doors can provide isolation will be labeled "Construction Area-- Authorized Personnel Only".

- All other areas will be isolated by a solid barrier. The minimum barrier allowed is 4 mil poly sheeting sealed to prevent migration of dust.
- Mechanical ventilation may be required.
- A solid wall is required if building envelope is opened to the outside.

**Contractor Responsibilities**

- The contractor will provide all barricading, isolation, and fencing material. OSU will not provide any materials.
- The contractor will also provide all appropriate warning and detour signs when sidewalks, exits, or roads are closed.
- Contractor will provide all other construction area signs.

**OSU Construction and Maintenance Safety Form**

**Send completed safety documents to Construction Contract Administration with contract and bonds.**

Date: \_\_\_\_\_ Project: \_\_\_\_\_  
 Start Date: \_\_\_\_\_ Completion date: \_\_\_\_\_  
 Contractor: \_\_\_\_\_ Contact: \_\_\_\_\_  
 Work # \_\_\_\_\_ 24 hr #: \_\_\_\_\_  
 OSU Project Mgr: \_\_\_\_\_ Work / 24hr #'s: \_\_\_\_\_  
 Dept Contact: \_\_\_\_\_ OSU EH&S Contact: \_\_\_\_\_  
 Preconstruction meeting? **Y N** Date/Time/Location: \_\_\_\_\_

**For the following items, prepare answers on a separate sheet for all items marked "Yes". Precede each answer with the appropriate item number. All boxes need to be checked**

Y	N	For This Project	If YES, then:
		<b>1</b> Will any confined spaces be accessed?	Describe location of entry Specify location of permit Notify EH&S prior to entry See SAF 209
		<b>2</b> Will hot work be performed (welding, cutting, brazing, etc.)?	Provide min. 5# 2A10BC extinguisher within 10 ft If indoors - provide and describe ventilation See SAF 214
		<b>3</b> Any products brought to campus?	Provide MSDS on site prior to first use; Make available to OSU on request
		<b>4</b> Will lead paint be impacted?	Describe plan to limit contamination
		<b>5</b> Will asbestos-containing-material be impacted?	Coordinate with OSU asbestos manager
		<b>6</b> Will <u>any</u> materials (construction debris, soil, water, etc) be removed from campus?	Describe in detail identity and disposition of material (how, where)
		<b>7</b> Any open trenches or holes?	Describe isolation procedures (see Page 1)
		<b>8</b> Will a crane be used?	Describe crane safety plan (include plan to prevent loads above occupied areas)
		<b>9</b> Is this project building a new facility, a major remodel?	Provide Site Safety plan Describe isolation procedures (see Page 1)
		<b>10</b> Is this a minor remodeling project?	Provide, or fill out model Site Safety Plan form ( see Page 3) Describe isolation procedures (see Page 1)
		<b>11</b> Will air contamination be produced (e.g. dust, CO, solvent vapors, VOCs, odors)?	Describe project ventilation and isolation Indicate position of building air intake(s)
		<b>12</b> Will there be noise > 85 dB?	Describe noise minimization plan
		<b>13</b> Will this project use a scaffold or an external chute?	Describe isolation, dust control, installation
		<b>14</b> Will this project involve a working surface >6' above a lower level	Describe fall protection
		<b>15</b> Will any "blind" saw-cuts or penetrations be made in existing foundations, floors, ceilings and/or walls?	Describe plan for detecting and protecting power lines or other building utility lines.

EH&S Review: \_\_\_\_\_ Date: \_\_\_\_\_

# Model Site Safety Plan

## 1. General Information

Contractor name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City, State, Zip \_\_\_\_\_  
 Site Safety Officer \_\_\_\_\_ Project Dates \_\_\_\_\_  
 Project Name \_\_\_\_\_

## 2. Emergency Information

Emergency Response	911	OSU EH&S and OSU Facilities Services must be notified in the event of an emergency
Hazardous Materials Spill		
MSDS on-site location		
OSU EH&S	(541) 737-2505	
Facilities Services	(541) 737-2969	

## 3. Contractor Key Personnel

	Name	Phone	Emergency Contact
Company Owner			
Project Manager			
Job Supervisor			
Site Safety Officer			
Other Responsible Individual			
24 Hour Notification			

List of employees on site \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

4. Hazard Evaluation/ Facility Impact	
Physical	Yes / No
Heavy Equipment	
Noise	
Heat	
Elevation	
Radiation Materials	
Excavations	
Underground Utilities	
Confined Spaces	
Fire Prevention	
Electrical	

5. Emergencies
Services
Evacuation Route
First Aid Location
Hazardous Materials Spill Procedure

## 6. Work Zones

Material Storage \_\_\_\_\_  
 Parking locations \_\_\_\_\_  
 Individuals with OSU keys \_\_\_\_\_  
 Access issues \_\_\_\_\_

## 7. Security measures

\_\_\_\_\_

## 8. Fire protection

\_\_\_\_\_





## **SECTION 01 56 39**

### **TREE AND PLANTING PROTECTION**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Section includes temporary fencing, barricades, and guards to protect trees, plants and groundcovers not indicated to be removed, as necessary and required to prevent damage above and below grade.

##### **1.02 DEFINITIONS**

- A. Dripline: Outer perimeter of branches of any tree or plant.
- B. Groundcover: Includes but not limited to plants and grass.

##### **1.03 PERFORMANCE REQUIREMENTS**

- A. The Contractor shall exercise utmost care to protect existing trees and plants designated to remain and shall comply with all protection requirements provided by Owner and City of Corvallis as conveyed through the Owner's Authorized Representative.
- B. The Contractor shall install tree protection fencing as detailed and shall prevent damage to shrubs, groundcover, trees, root systems, soil, bark, foliage, branches and limbs due to construction activities, including but not limited to:
  - 1. Soil contamination, erosion, and compaction.
  - 2. Excessive wetting, and ponding due to storm water, and construction run-off.
  - 3. Alteration of grade, stockpiling of soil, debris, and materials.
  - 4. Damage to soil, roots, bark, trunk, limbs, branches, and foliage.
  - 5. Prevent unauthorized cutting, breaking, skinning and bruising of roots, branches, and bark.

##### **1.04 SUBMITTALS**

- A. Procedural proposal for tree and plant protection, describe methods of protection, and stabilization, provide drawings and supporting documentation as directed.
- B. Contractor's Condition Inspection; include written report and color photographs.

##### **1.05 PROJECT CONDITIONS**

- A. Install protection during initial mobilization at the Work site, and maintain until substantial completion.
- B. If, in the opinion of the Owner's arborist, additional protection is required, the Contractor shall install additional fencing as directed and without cost to the Owner.
- C. The location and requirements for additional fencing shall be determined by the

Owner's arborist prior to, and at any time during the course of the Work.

- D. Fencing:
  - 1. Fencing shall be installed at the tree and plant protection areas as detailed on Plans, or as directed by the Owner's Authorized Representative.
  - 2. Tree and plant protection fences shall remain in place until all Work is completed and shall not be removed or relocated without the approval of the Owner's Authorized Representative.
- E. Driving and Parking:
  - 1. Not permitted off paved surfaces without the approval of the Owner's Authorized Representative.
  - 2. When approved, the Contractor shall place plywood of sufficient thickness and width to support vehicles and prevent rutting on the area to be driven on.
  - 3. Care shall also be taken with respect to existing lawn sprinkler systems.
- F. Storage of materials and Debris: Not permitted off paved surfaces.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURED COMPONENTS**

- A. Chain Link Fencing: 11 gage galvanized chain link, six feet. tall, and 1.5 inch inside diameter galvanized steel line posts and 2.5 inch inside diameter corner posts, provide lockable gates as necessary.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions: Inspect trees, plants, and groundcovers, document existing conditions prior to installation of protection.

### **3.02 EXECUTION**

- A. Pruning and Cutting of Roots, Branches and Foliage:
  - 1. Review conditions with Architect or Owner prior to need for work, and proceed as directed.
  - 2. All pruning to be done by Owner's landscape maintenance personnel or ISA Certified arborist under the direction of Owner's Landscape Management Department.
  - 3. Perform pruning and cutting with sharp instruments intended for the purpose; do not break or chop.
- B. Root Cuttings:
  - 1. Carefully and cleanly cut roots and branches of trees indicated to be left standing where such roots and branches obstruct new construction.

2. Protect exposed roots with wet burlap until they can be covered with soil.
- C. Excavation and Trenching Within Drip Lines:
  1. Permitted where indicated, and at other specifically approved locations.
  2. Tunnel under or around roots by hand digging or boring.
  3. Do not cut main lateral roots and tap roots over one inch diameter; cut smaller roots which interfere with installation of new Work.
  4. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover, or pack with peat moss and wrap with burlap.
  5. Water and maintain roots in moist condition and temporarily support and protect from damage until permanently relocated and covered with backfill.
- D. Existing Grading: Maintain within drip line of trees and plants unless otherwise indicated on the drawing and approved by the Owner's Authorized Representative.
- E. Tree Protection:
  1. Provide temporary fence complying with Section 01 51 00 for protection of trees to remain.
  2. Extend fencing ten feet beyond dripline, except where greater distance is required for protection of Elm trees.
  3. Prevent entry into protected areas except as authorized in writing by the Owner's Authorized Representative.

### **3.03 REPAIR AND REPLACEMENT OF TREES AND PLANTS**

- A. Repair trees or shrubs damaged by construction operations as directed by the Owner.
- B. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.
- C. Damaged Trees, Shrubs and Groundcover:
  1. Replace where Owner's Authorized Representative determines restoration to normal growth pattern is not possible; plant and maintain as directed.
  2. Replacement trees up to 13 inches caliper and shrubs up to 4 feet tall: Same size as damaged tree or shrub, species selected by the Owner's Authorized Representative.
  3. Trees over 13 inch caliper and shrubs greater than 4 feet tall: Compensate Owner as determined by an acceptable consulting arborist registered with the American Society of Consulting Arborists.
  4. Replacement groundcovers: Same size and quality as damaged species selected by Owner's Authorized Representative.

**END OF SECTION**



## SECTION 01 60 00

### PRODUCT REQUIREMENTS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Summary:
  - 1. Product options.
  - 2. Owner-furnished products.
  - 3. Product delivery, storage and handling.

##### 1.02 PRODUCTS

- A. Products:
  - 1. New material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.
  - 2. Products may also include existing materials or components specifically identified for reuse.
- B. Use interchangeable components of the same manufacture for similar components.
- C. Unless otherwise specified, all material and equipment shall be new; free from defects impairing strength, durability, and appearance; of current manufacture.
- D. Items specified shall be considered minimum as to quality, function, capacity, and suitability for application intended.
- E. Items incorporated into the Work shall conform to applicable specifications and standards designated, and shall be of size, make, type, and quality specified.
- F. Design, fabricate, and assemble in accordance with current best engineering, industry, and shop practices.
- G. Manufacture like parts of duplicate units to standard size and gauge to make them interchangeable.
- H. Two or more items of the same kind shall be identical and made by the same manufacturer.

##### 1.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- C. Products Specified by Naming One [or More] Manufacturer[s]: Products of manufacturer[s] named and meeting specifications, no options or substitutions

allowed.

D. Substitution Procedure: Under Section 01 25 00.

#### **1.04 REUSE OF EXISTING PRODUCTS**

- A. Except as specifically indicated or specified, materials and equipment removed from existing construction shall not be used in the completed Work.
- B. For material and equipment specifically indicated or specified to be reused in the Work:
  - 1. Use care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
  - 2. Arrange for transportation, storage, and handling of products which require off-site storage, restoration, or renovation.
  - 3. Remove and reinstall mechanical units, vents, guys, antennae, and electrical and grounding wires or conduits.

#### **1.05 OWNER FURNISHED PRODUCTS**

- A. Designate delivery dates of Owner-furnished items in the construction schedule.
- B. Receive, unload, store and handle Owner-furnished items at the site; protect from damage.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Transport, handle, store and protect products in accordance with manufacturer's instructions.
- B. Arrange deliveries in accordance with construction schedules; coordinate to avoid conflict with Work and site conditions.
- C. Deliver and store products in undamaged condition in manufacturer's original containers or packaging with identifying labels intact and legible.
- D. Inspect shipments to assure compliance with Contract Documents and reviewed submittals, and that products are undamaged.
- E. Prevent soiling or damage to products or packaging.
- F. Interior Storage: Maintain required temperature and humidity ranges. Verify that Owner furnished storage meets product manufacturer's requirements.
- G. Exterior Storage:
  - 1. Store materials above ground to prevent soiling and/or moisture infiltration.
  - 2. Cover materials with waterproof breathable sheet coverings; provide adequate ventilation.
  - 3. All storage locations to be approved in advance by the Owner.
- H. Arrange storage to provide access for inspection.
- I. Coordinate with Owner's Authorized Representative all on-site storage activities.
- J. Provide for security of stored products.

**END OF SECTION**

## **SECTION 01 73 29**

### **CUTTING AND PATCHING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

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

##### **1.02 RELATED SECTIONS**

- A. Section 01 25 00, Product Substitution Procedures.
- B. Section 01 33 23, Shop Drawings, Product Data, Samples

##### **1.03 SUBMITTALS**

- A. Submit written request in advance of cutting or alteration which affects:
  - 1. Structural integrity of any element of the Work.
  - 2. Efficiency, maintenance, or safety of any operational element.
  - 3. Visual qualities of sight exposed elements.
  - 4. Work of Owner or separate contractor.
- B. Include in request:
  - 1. Identification of project.
  - 2. Location and description of affected work.
  - 3. Necessity for cutting or alteration.
  - 4. Description of proposed work, and products to be used.
  - 5. Alternatives to cutting and patching.
  - 6. Effect on work of Owner or separate contractor.
  - 7. Written permission of affected separate contractor.
  - 8. Date and time work will be executed.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS**

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution under provisions of Section 01 25 00.

#### **PART 3 EXECUTION**

##### **3.01 EXAMINATION**

- A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.



- B. After uncovering existing work, inspect conditions affecting performance of Work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 PREPARATION**

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

### **3.03 CUTTING AND PATCHING**

- A. Execute cutting, fitting and patching to complete work.
- B. Fit products together, to integrate with other work.
- C. Remove and replace defective or non-conforming work.
- D. Provide openings in the work for penetration of mechanical and electrical work.

### **3.04 PERFORMANCE**

- A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- B. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval from Owner's Authorized Representative.
- C. Restore work with new products in accordance with requirements of Contract Documents.
- D. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with approved fire rated material, to full thickness of the penetrated element.
- E. Refinishing:
  - 1. Refinish surfaces to match adjacent finish.
  - 2. For continuous surfaces, refinish to nearest intersection or natural break.
  - 3. For an assembly, refinish entire unit.

**END OF SECTION**

## SECTION 01 74 00

### CLEANING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Related requirements specified elsewhere, cleaning for specific products or work: Specification section for that work.
- B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
- C. At completion of Work remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

##### 1.02 QUALITY ASSURANCE

- A. Standards: Maintain project in accord with applicable safety and insurance standards.
- B. Hazard Control:
  - 1. Store volatile wastes in covered metal containers.
  - 2. Provide adequate ventilation during use of volatile or noxious substances.

##### 1.03 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

##### 1.04 DURING CONSTRUCTION:

- A. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- B. At reasonable intervals during progress of Work clean site and public properties, and dispose of waste materials, debris and rubbish.
- C. Provide on-site containers for collection of waste materials, debris and rubbish.
- D. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
- E. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until project is ready for Substantial Completion or occupancy.
- F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

### **1.05 FINAL CLEANING**

- A. Employ experienced workers, or professional cleaners, for final cleaning.
- B. In preparation for Substantial Completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Remove grease, dust, dirt, stains, labels, and other foreign materials from exposed interior and exterior finished surfaces.
- D. Remove putty, paint, labels, lubricants, etc., from windows, mirrors, and sash, and then polish, taking care not to scratch glass.
- E. Vacuum carpeting (shampoo where required), removing debris and excess nap.
- F. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- G. Replace air filters where units were operated during construction.
- H. Maintain cleaning until project, or portion thereof, is occupied by Owner.

**END OF SECTION**

**SECTION 01 77 00**

**CONTRACT CLOSEOUT**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. The requirements specified in this section relate to all Contractors individually performing under these Contract Documents:
  - 1. Project Record Documents.
  - 2. Final review and payment.
- B. Related work specified elsewhere:
  - 1. OSU General Conditions.
  - 2. Shop Drawings, Product Data and Samples, Section 01 33 23.

**1.02 PROJECT RECORD DOCUMENTS**

- A. The Project Record Documents shall be organized to include the following information:
  - 1. Table of Contents
  - 2. Project Team List
  - 3. Specifications (Including Addenda and Change Orders)
  - 4. Drawings
  - 5. Inspection Reports, as applicable
  - 6. Signed Warranty(ies)
  - 7. Maintenance Instructions
- B. Draft Project Record Documents shall be submitted for review upon 75% completion of the Work.
- C. Project Record Documents shall be submitted electronically to the Owner. Hard copies will not be accepted.
- D. The project team list shall include the name, address, and phone number of the Owner, Contractor, Inspector, Subcontractors, and the materials manufacturers.
- E. Legibly mark each Specification section to indicate actual as-built condition indicating changes in the Work made by addenda or change order or actual materials used and actual manufacturer(s) used.
- F. Maintain current and accurate as-built mark-ups during construction and make available to Owner's Authorized Representative upon request.
- G. Legibly mark the drawings to indicate actual as-built conditions indicating changes in the Work made by addenda or change order or actual conditions which differ from the drawings.
- H. Redraw or provide new drawings as required for a complete as-built set of drawings. The Contractor shall maintain current and accurate as-built mark-ups during construction and make available to Owner's Authorized Representative.

- I. Include inspection reports if applicable.
- J. Include, in a single section, all copies of the Project's labor and material warranties clearly marked to identify the Owner's responsibilities under the terms of each warranty and the section of Work that each warranty covers. One set must be clearly marked as containing original documents.
- K. In the case of an elevator installation, the Contractor's and manufacturer's warranty shall provide for the Owner's right to respond to emergency/car failure situations for the purpose of extricating individuals trapped in the elevator.
- L. Include maintenance instructions complete with technical information and name, address, and phone number of the Contractor(s) and manufacturer(s) of each material and product.

### **1.03 FINAL REVIEW AND PAYMENT**

- A. Prior to completion, the Contractor shall inspect the Work and make a Punch-list noting all items that are incomplete and/or incorrect.
- B. The Contractor shall notify all Subcontractors in writing of incomplete and/or incorrect items. Notify far enough in advance of the completion date that the Work can be completed on schedule. Said Work shall be immediately corrected.
- C. Should conditions prevail which prohibit some elements of the Work from being accomplished, but the work-in-place will perform the primary function (i.e., painting cannot be completed due to high moisture content of masonry walls.) the Contractor shall record the reason with this Punch-list item requesting temporary delay in completion from the Owner in writing.
- D. Notify the Owner in writing that all items are completed and ready for final review or else that the Work product is fully usable, but some listed deficiencies remain to be completed. Submit all record documents at this time.
- E. The Owner will review all documents. When the documents include a Contractor's request for delay in completion, the Owner will review all Work which is certified as complete to the best knowledge of the Contractor. The Owner will also review the listed incomplete Work and assign a value to such uncompleted work.
- F. The Contractor shall make the required corrections to the Work expeditiously. A letter will be addressed to the Contractor informing the Contractor of the project status.
- G. When Contract closeout procedures are completed and all Punch-list deficiencies have been corrected, provide Owner with final corrected Project Record Documents based on Owner's preliminary review. Correct Project Record Documents shall be in electronic format.
- H. Final Completion by the Owner will be documented and the Contractor will receive written notice of acceptance of the Work and notification that final

payment may be billed and released.

- I. All warranties shall commence and become effective beginning on the date of Substantial Completion.

**END OF SECTION**

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## SECTION 02 41 19 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Salvage of existing items to be reused or recycled.
- B. Contractor shall verify with OSU Capital Planning & Development if approved Historic Preservation Permit (HPP) for demolition is required prior to Work of this Section.
  - 1. Demolition work is not permitted prior to verification with OSU's designated representative.

#### 1.3 DEFINITIONS

- A. General: Application: The following requirements apply to those items indicated in the Drawings.
- B. Demolish: Same as "remove."
- C. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- D. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store for sale or reuse.
- E. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- F. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- G. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Unless otherwise indicated, salvaged and saved items are the property of Owner.
- C. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

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## 1.5 PREINSTALLATION MEETINGS

- A. Schedule conference with cutting conference. See OSU Standards in 01 73 29 "Cutting and Patching" for requirements.
- B. Predemolition Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of construction to be selectively demolished, removed and salvaged items.
    - a. Site-walk Review: Walk-through project with Architect to review all items for salvage and reuse.
    - b. Review whether additional survey of existing condition by structural engineer is required.
    - c. Review means and methods of demolition for items indicated to be salvaged or saved for reuse.
    - d. Review means and methods of demolition for items to be removed and adjacent to construction to remain visible.
  - 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 4. Review areas where existing construction is to remain and requires protection.
  - 5. Document meeting with meeting minutes or other acceptable form, for review and distribution of all items to be salvaged and saved for reuse.
  - 6. See OSU Standards in Section 01 73 29 "Cutting and Patching" for cutting procedures and requirements.

## 1.6 SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician, where in scope of Work.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: After predemolition conference, indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted, where applicable.
    - a. Include list of items for salvage.
    - b. Indicate any special removal requirements or methods.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.



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4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Owner's requirements. Submit before Work begins.
  - E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- 1.7 CLOSEOUT SUBMITTALS
- A. Inventory: Submit a final list of items that have been removed and salvaged.
- 1.8 QUALITY ASSURANCE
- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- 1.9 FIELD CONDITIONS
- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
    1. Maintain free and safe passage to and from building during demolition.
  - B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
    1. Before selective demolition, Contractor will verify adequacy of structure and shoring.
  - C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
  - D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
    1. Hazardous materials will be removed by Owner before start of the Work.
    2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
  - E. Storage or sale of removed items or materials on-site is permitted where reviewed with Contractor, Owner and Architect for location and procedures prior to commencement of demolition Work.
    1. Provide adequate storage areas for salvaged heavy timber and other wood items, including sufficient area required for sorting and grading activities.
  - F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
    1. Maintain fire-protection facilities in service during selective demolition operations.
  - G. Shoring: Prior to commencement of demolition Work, verify all required shoring is in place for structural removal and modification.

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### 1.10 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.
- B. Coordinate storage layout areas with demolition and new construction schedules as to not interfere with Owner's and Contractor's operations.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
  - 1. Review required scope of surveying in predemolition conference.
  - 2. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
  - 3. Perform surveys where removal of structure has not been completed.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
  - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
  - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

### 3.2 PREPARATION

- A. Refrigerant: Where in scope of Work, before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

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### 3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
1. Arrange to shut off utilities with utility companies.
  2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

### 3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  3. Cover and protect equipment that have not been removed.
  4. Comply with OSU Standards and requirements for temporary enclosures, dust control, heating, and cooling in OSU Section 01 51 00 "Construction Facilities and Temporary Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

### 3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Cut items complying with OSU Standards in Section 01 73 29 "Cutting and Patching."
5. Do not use methods for removing wood construction that damages surfaces or edges.
6. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
7. Maintain fire watch during and for at least four (4) hours after flame-cutting operations.
8. Maintain adequate ventilation when using cutting torches.
9. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
10. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
11. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items: Verify during preconstruction meeting.

1. Clean salvaged items.
  - a. Clean items for sale and/or reuse to functional condition adequate for reuse.
2. Pack or crate items after cleaning. Identify contents of containers.
  - a. Pack or crate items after cleaning and repair, and identify contents of containers for items for sale.

3. Store items in a secure area until delivery to Owner.
  4. Metal components, and crane rail and equipment storage: Store in dry locations, off the ground.
  5. Transport items to Owner's storage area designated by Owner.
  6. Protect items from damage during transport and storage.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections, and one of the following:
1. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
  2. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Tile: Remove existing tile down to substrate board or concrete substrates, including all setting mortar and membranes. Cut masonry prior to removal where indicated to remain, using methods to not damage portions to remain.
- E. Carpet: Remove carpet and adhesives according to replacement carpet manufacturer's written recommendations. Do not use methods requiring solvent-based adhesive strippers unless approved by Owner and Architect.
- F. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them.
1. Do not allow demolished materials to accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

### 3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.

### 3.9 SELECTIVE DEMOLITION SCHEDULE

- A. All items listed below shall be reviewed, prior to commencement of demolition Work, during the predemolition conference.
- B. Remove: As indicated.
- C. Remove and Salvage: As indicated.
  - 1. Doors, frames, glass and other items indicated for reinstallation.
- D. Existing to Remain: As indicated, or otherwise not indicated for removal.

END OF SECTION

## SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Slabs-on-grade.
  - 2. Concrete toppings.
- B. Related Sections:
  - 1. Section 05 50 00 "Metal Fabrications" for steel items cast-in concrete

## 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

## 1.4 COORDINATION

- A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
- B. Coordinate all items to be cast-in to concrete. Contractor shall review items prior to placement.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Also include manufacturer's printed product data on concrete additives, curing compounds, and sealers, clearly marked to indicate selected products.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

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1. Indicate amounts of mixing water to be withheld for later addition at Project site.
  2. Include substantiating substantial test data to show compliance with ACI 318 Chapter 5 (requirements for mix designs). Sample standard deviation shall be calculated per ACI 318 section 5.3.1.1 or 5.3.1.2. Documentation of average compressive strength shall also be submitted per ACI 318-11 section 5.3.3.1.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. The steel reinforcement detailer shall generate all shop drawing bending and installation details from the structural and architectural drawings and specifications. The use of reproductions or photocopies of the contract drawings shall not be permitted.
1. Provide details of fabrication, bending, and placement, prepared according with CRSI (DA4) - Manual of Standard Practice and to ACI SP-66 (ACI Committee 315), "Details and Detailing of Concrete Reinforcement." Shop drawing re-submittals shall clearly identify all revisions to previous submittals.
    - a. Heavy ink clouded outlines (revision clouds) shall be drawn around revised areas of individual sheets.
    - b. Architect/Engineer will not review information outside of revision clouds on resubmitted drawings.
- D. Qualification Data: For Installer, manufacturer, testing agency.
1. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience.
- E. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
  2. Admixtures.
  3. Curing compounds.
  4. Floor and slab treatments.
  5. Bonding agents.
  6. Adhesives.
  7. Vapor retarders.
  8. Semirigid joint filler.
  9. Joint-filler strips.
  10. Repair materials.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
  - B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.



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1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
  2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
1. All admixtures shall be compatible with one another.
  2. Where single-source manufactured admixtures is not possible or where performance and experience of use warrant multiple manufacturers, compatibility reports are required.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete subcontractor.
  2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, curing procedures, construction contraction and isolation joints, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection..

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## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301 (ACI 301M).
  - 2. ACI 117 (ACI 117M).
  - 3. ACI 303R, for architectural concrete finishes.
- B. Redesign or Departures from Requirements of Contract Documents Initiated by Contractor:
  - 1. Obtain written acceptance from the Architect and Architect's consultants.
  - 2. Bear costs for Contractor-initiated or construction error due to changes in type, form, system, or details of construction from those indicated by the contract documents.
  - 3. Costs of review of such changes by Architect and Architect's consultants will be deducted from Contract Sum by Change Order.

### 2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

### 2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

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## 2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I/II. Cement to be low alkali cement with Equivalent Alkali limits as indicated by ASTM C150.
    - a. Fly Ash: ASTM C 618, Class C or F. Refer to General Structural Notes.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source. Aggregates to be free of materials with deleterious reactivity to alkali in cement.
  - 1. Maximum Coarse-Aggregate Size: Refer to Structural Drawings.
  - 2. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 (0.3-mm) sieve, and less than 8 percent may be retained on sieves finer than No. 50 (0.3 mm).
  - 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C1602 and potable. Clean and not detrimental to concrete. Do not add water to mix at project site unless letter from concrete supplier is obtained documenting amount of water withheld from mix to be added at project site.

## 2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

1. Products:
  - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
  - b. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
  - c. Euclid Chemical Company (The); Eucon, CIA.
  - d. Grace Construction Products, W.R. Grace & Co.; DCI.
  - e. Sika Corporation; Sika CNI.

## 2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
  1. Acceptable Products: Provide one of the following, or other meeting the moisture vapor emission rate requirement of concrete moisture vapor reduction admixture:
    - a. Vapor Block VBLP15 by Raven Industries Inc.; [www.ravenefd.com](http://www.ravenefd.com).
      - 1) 0.0057 Perms per ASTM E 96.
    - b. Stego Wrap 15 mil Class A by Stego Industries, LLC; [www.stegoindustries.com](http://www.stegoindustries.com).
      - 1) 0.0098 Perms per ASTM E 154.
    - c. Perminator 15 mil by W. R. Meadows, Inc.; [www.wrmeadows.com](http://www.wrmeadows.com).
      - 1) 0.0063 Perms per ASTM E 96.

## 2.7 CURING MATERIALS

- A. General: For all topical treatments, confirm compatibility with finish floor manufacturer's requirements.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- E. Water: Potable.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
  1. Compatible with floor treatments.

## 2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
  4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
  4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and in accordance with the following:
1. Compressive Strength: Refer to General Structural Notes.
  2. Maximum Water-Cementitious Materials Ratio: Refer to General Structural Notes.
  3. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having the air content specified in the General Structural Notes.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 20 percent.
  2. Combined Fly Ash and Pozzolan: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
  4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

## 2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
  3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

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**PART 3 - EXECUTION****3.1 EMBEDDED ITEMS**

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

**3.2 VAPOR RETARDERS**

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
  - 2. Seal penetrations with manufacturer's recommended tape and/or manufacturer's recommended mastic.

**3.3 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

**3.4 JOINTS**

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Roughen interface to  $\frac{1}{4}$ " amplitude at locations where fresh concrete is placed against or partially hardened or partially hardened concrete surfaces.

### 3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

### 3.6 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.



1. Apply float finish to surfaces indicated surfaces.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  2. Finish surfaces to the following tolerances, according to **ASTM E 1155 (ASTM E 1155M)**, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
    - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
  3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, **10-ft.- (3.05-m-)** long straightedge resting on two high spots and placed anywhere on the surface does not exceed **1/8 inch (3.2 mm)**..

### 3.7 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

### 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

- a. Water.
  - b. Continuous water-fog spray.
  - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
  - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
  - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
- a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.9 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least **[one]** month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

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### 3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  - 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  - 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

- E. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections: As indicated in the Statement of Special Inspections and Testing sheets of the Drawings.
- D. Concrete Tests: As indicated in the Statement of Special Inspections and Testingsheets of the drawings.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

END OF SECTION

## SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Structural steel.
  - 2. Grout.

## 1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges" that support design loads.

## 1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.
  4. Shop drawing re-submittals shall clearly identify all revisions to previous submittals.
    - a. Heavy ink, clouded outlines (revision clouds) shall be drawn around revised areas of individual sheets.
    - b. Engineer/Architect will not review information outside of revision clouds on resubmitted drawings.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Articles to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

#### 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: The installer shall have at least five years experience in this size and type of structure.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- C. Comply with applicable provisions of the following specifications and documents:
1. AISC 303.
  2. AISC 341 and AISC 341s1.
  3. AISC 360.
  4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and

spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

## 1.8 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and top coats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and direction for installation.

## PART 2 - PRODUCTS

### 2.1 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
1. W-Shapes: 60 percent.
  2. Channels, Angles -Shapes: 60 percent.
  3. Plate and Bar: 25 percent.
  4. Cold-Formed Hollow Structural Sections: 25 percent.
  5. Steel Pipe: 25 percent.
  6. All Other Steel Materials: 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels, Angles Shapes: ASTM A 36/A 36M, Grade 50 (345).
- D. Plate and Bar: ASTM A 36/A 36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

- F. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
- G. Welding Electrodes: Comply with AWS requirements.

## 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
  - 1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
- B. Threaded Rods: as indicated.
  - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
  - 2. Washers: [ASTM F 436 (ASTM F 436M), hardened carbon steel.
  - 3. Finish: Plain.

## 2.3 PRIMER

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

## 2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
  - 1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  - 2. Mark and match-mark materials for field assembly.
  - 3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.



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- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
    - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
  - C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
  - D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
  - E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to - SP 3, "Power Tool Cleaning."
  - F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.
  - G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
    - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
    - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
    - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
  - H. Exposed Structural Steel: For structural steel exposed at interior locations.
    - 1. Fit and shop assemble items in largest practical sections for delivery to site.
    - 2. Fabricate items with joints tightly fitted and secured.
    - 3. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting rust, scale, seam marks, rolled trade names, and roughness.
    - 4. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating and shop priming.
    - 5. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
    - 6. All structural exterior steel exposed to weather shall be hot dipped galvanized or stainless steel.

## 2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## 2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
  - 2. Surfaces to be field welded.
  - 3. Surfaces of high-strength bolted, slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 5. Galvanized surfaces.
  - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

## 2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspection agency to inspect shop welds and high-strength bolted connections and tests, and prepare test reports in accordance with "Testing and Inspection" Article 3.6.
  - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

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**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

**3.3 ERECTION**

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.

- F. Do not use thermal cutting during erection unless approved by Architect.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Corrective Measures:
  - 1. Any errors in locations or inaccuracies in the setting of anchor bolts, base plates, bearing plates, or other items of attachment of support for steel work shall be reported to the Engineer/Architect, and shall be corrected in a manner subject to the approval of the Engineer/Architect.
  - 2. Any misfits due to errors in fabrication shall be reported immediately to the Engineer/Architect, along with proposed method of correction of same and Engineer/Architect approval obtained before proceeding with corrective measures.
  - 3. No members shall be cut or burned without specific approval in writing.
  - 4. Bolted or welded connections, joints, or fastenings, which are classified as defective in the opinion of the Engineer/Architect, shall be corrected by the Contractor in a manner subject to the Engineer/Architect's approval.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspection agency to provide inspection and required tests, and to prepare test reports in accordance with "Testing and Inspection" Article 3.6 below.

### 3.6 TESTING AND INSPECTION

- A. All structural steel work is subject to special inspection. Testing Agency and Inspector Requirements:

1. Special Inspector: Testing Agency shall provide qualified "Special Inspector" who will perform the inspection services.
  2. Testing agency will conduct and interpret tests, and state in each report whether test specimens comply with or deviate from requirements.
  3. Testing agency will notify the Owner and Engineer/Architect immediately of discrepancies in the work which are time-critical or affect the construction progress.
  4. Personnel inspecting connections part of the SLRS shall be qualified per Section 1.5 "Quality Assurance".
- B. Fabrication Inspection: When approved by the Building Official, the Owner, and Engineer/Architect, full-time special inspection in the fabrication shop by the Owner's Testing Agency may be waived, subject to the following:
1. The Fabricator participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.
  2. All shop inspection is provided by the Contractor, per the requirements herein, and is documented. Reports and test results are to be available for the Owner's Inspector to review.
  3. A specific quality control plan for this project shall be developed and submitted to the Structural Engineer for approval prior to the prefabrication/pre-erection meeting.
  4. Periodic inspection by the Owner's Inspection Agency is allowed by the Fabricator.
  5. Certified Plants: Continuous plant inspection is not required at plants producing prefabricated steel products which are certified by the Building Official.
- C. Contractor Responsibilities Related to Shop and Field Inspections:
1. Maintain complete records of all quality control and testing performed by the Contractor.
  2. Furnish all electrical power, turning or moving of members, hoisting, staging, and other facilities required for inspection.
  3. Provide testing agency with access to places where structural steel work is being fabricated or erected so required inspection and testing can be accomplished.
  4. Correct deficiencies in, or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
  5. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
  6. Grant Inspectors full authority to inspect all material and work that fails to conform in every respect to these specifications.
  7. When required by Engineer/Architect or Owner's Independent Testing Agency or Contractor's engaged inspection organization, make adequate platforms available to the Inspector for the purpose of checking high-strength bolts and welds. Scaffolding shall be provided to ensure safe performance of this operation.
- D. Shop and Field Tests and Inspections: Inspections and testing shall be performed as indicated in the Contract Documents. Additional requirements are as follows:
1. Welded Connections: In addition to visual inspection, welded connections will be tested and inspected as required by the Contract Documents and Specifications, according to AWS D1.1. Inspection procedures at Testing Agency's option, are listed below:

- 
- a. Procedures
    - 1) Liquid Penetrant Inspection: ASTM E 165.
    - 2) Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - 3) Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
    - 4) Ultrasonic Inspection: ASTM E 164.
  - b. Inspector shall:
    - 1) Verify Welding Procedure Specifications (WPSs) sheet has been provided and has been reviewed with each welder performing the weld. Welds not executed in conformance with the WPSs are rejectable.
    - 2) Verify fit-up meets tolerances of WPSs and mark joint prior to welding.
    - 3) Verify welding consumables per WPSs.
    - 4) Verify welding qualification and identifications.
    - 5) Observe preheat and interpass temperatures, and weld pass sequence for conformance with WPSs.
    - 6) Nondestructive test all complete penetration groove welds for conformance with weld quality and standard of acceptance per requirements for testing of welds subject to tensile stress by ultrasonic methods in AWS D1.1. Pass sound through entire weld volume from two crossing directions to the extent feasible. Nondestructive test all complete penetration groove welds of beam flanges to column flanges and column stiffeners and cap plates, and all complete penetration groove welds of column splices and columns to base plates for conformance with weld quality and standard of acceptance per requirements for testing of welds by magnetic particle testing in AWS D.1 in addition to ultrasonic testing methods.
    - 7) All partial penetration, fillet, and other remaining welds shall be visually inspected.
    - 8) Where ultrasonic testing is performed, the entire weld shall be tested.
  - c. Ultrasonically test base metal thicker than 1 1/2 inches after welding is completed for discontinuities behind welds in accordance with IBC Section 1708.4.
  - d. For connections part of the SLRS, including Demand Critical Welds, nondestructive testing (NDT) requirements shall comply with AISC 341-05 (seismic provisions) Appendix Q (Q5.2).
  - e. For Demand Critical Welds, inspect removal of backup bars and runoff plates, preparatory grinding, and execution of reinforcing fillet.
  - f. Test column webs for cracking using dye penetrant or magnetic particle test over 3-inch minimum zone above and below continuity (stiffener) plates after welding. All cracks shall be reported to the Engineer, repaired, and retested. No cracks will be permitted in the final construction.

**3.7 REPAIRS AND PROTECTION**

- A. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- B. Touchup Painting: Cleaning and touchup painting are specified in Division 9.

END OF SECTION 05 12 00

## SECTION 06 40 00 – ARCHITECTURAL WOODWORK

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes interior casework and woodwork, including but not limited to the following:
  - 1. Architectural Casework, Cabinets, Hardware and Accessories.
    - a. Medium Density Fiber Board (MDF)
    - b. Laminate finishes (PLAM-#)
    - c. Cubbies
    - d. Wood trim (WD-#)
    - e. Benches.
  - 2. Countertops and desk surfaces.
  - 3. Wood furring, blocking, shims, and hanging strips for installing architectural woodwork unless concealed within other construction before installation.
- B. Related Requirements:
  - 1. Section 01 23 00 "Alternates".
  - 2. Section 09 22 16 "Non-Structural Metal Framing" for metal furring, blocking.
  - 3. Section 09 29 00 "Gypsum Board".
  - 4. Division 26 "Electrical" for sections for electrical work to be coordinated with cabinets.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical treatment manufacturer's written instructions for finishing treated material.



2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, attachment devices, and other components.
  1. Show connection details half-size.
  2. Indicate coordination of fabrications with electrical and plumbing work.
- C. Sample:
  1. Woodworking Products: For each species, cut, profile, and finish; demonstrate range of color and grain variation expected in Work. Two feet by board, or molding, width; One foot by panel width.
    - a. Plastic Laminate: One sample of each color, and surface type.
- D. Qualification Data: For Installer/Fabricator.
- E. Product Certificates: For each type of product.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For cabinets, woodwork finishes, hardware and upholstery to include in operation and maintenance manuals.
  1. In addition to items specified in Division 01 Sections for operation and maintenance submittal requirements, include the following:
    - a. Methods for maintaining upholstery fabric.
    - b. Precautions for cleaning materials and methods that could be detrimental to finishes and performance for all exposed finishes.
    - c. Methods for maintaining and adjusting hardware.

#### 1.6 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with the Woodwork Institute's "Architectural Woodwork Standards" for grades of indicated for construction, finishes, installation, and other requirements.
  1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

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### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver wood materials only when environmental conditions comply with requirements specified for installation areas. If materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

### 1.8 FIELD CONDITIONS

- A. Temperature and Humidity for Installation: As required by referenced quality standards, and fabricator to maintain moisture content of installed Work within 1.0 percent of optimum moisture content, maintain conditions until final acceptance.
- B. Do not install materials that are wet, moisture damaged, or mold damaged.
- C. Field Measurements: Taken prior to fabrication of woodwork to be fitted to other construction, verify dimensions on shop drawings.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

### 1.9 COORDINATION, SEQUENCE AND SCHEDULING

- A. Equipment Coordination: Distribute copies of approved equipment schedules and from salvaged Materials, fixtures scheduled in Division 26 "Electrical" sections to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with clearance requirements.
  - 1. Where dimensional conflicts occur, notify Architect or indicate on Shop Drawings.
- B. Complete work in installation areas which could damage architectural woodwork, and establish controlled environmental conditions prior to delivery of materials.
- C. Deliver anchoring devices to be built into substrates, well in advance of time substrates are to be built.
- D. Conditioning Period: Store wood products for four days (96 hours) at Project prior to installation.
- E. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.
- F. Coordinate wood finishes with all wood-veneer applications in Project.

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**PART 2 - PRODUCTS****2.1 ARCHITECTURAL FABRICATORS**

1. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood paneling, wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

**2.2 ARCHITECTURAL CABINETS AND WOODWORK, GENERAL**

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
  1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. All cabinets, casework, countertops, fabrications and woodwork shall be AWS Premium Grade, unless indicated otherwise.
- C. Fire Performance Characteristics: Comply with ASTM E 84 for classification indicated and required by code.

**2.3 MATERIALS, GENERAL**

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.
  2. Wood Moisture Content: 10 percent.
  3. All wood shall meet ASTM 84 Class B flame spread requirements.
- B. Hardwood Lumber for Opaque Finishes: AWS Quality Standards Sections 6 and 7, Custom Grade; solid stock AWI listed closed-grain hardwood.
- C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated; formaldehyde free.
  1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 155, unless indicated otherwise.
    - a. Flame Spread Class C, Flame Spread Index 135, ASTM E84, Smoke Developed Index 200.
  2. Particleboard: ANSI A 208.1 Mat-Formed Wood Particleboard Grade M3, 0.75 inch thick, 45 pound density formaldehyde free.
    - a. Basis-of-Design Products:

- 1) Medite II by Roseburg Forest Products.
  - 2) Skyblend by Roseburg Forest Products.
  3. Casework Plywood: 0.75 inch thickness Cross-banded, balanced seven-ply of solid Baltic birch veneer free of voids and bonded with water-proof glue, 1.5 mm face veneer. Provide B/BB Grade panels for having a surface exposed to view, CP/CP Grade for panels providing a substrate for thin bonded finish or paint; provide C/C Grade for structural use with no aesthetic requirements; sheet sizes as necessary for fabrications required and to optimize material utilization with minimal waste.
    - a. Subflooring: Five-ply Baltic Birch plywood with phenolic glue and sanded face specifically intended for use as an underlayment for finish flooring;, 0.5 inch thick; 4 by 4, 4 by 5 and 4 by 8 foot sheets; provide sheet sizes necessary for optimum material utilization and to minimize waste.
      - 1) Basis-of-Design Product: HU-845 by Halex.
  4. Medium Density Overlay MDO Panels: 0.75 inch thick, minimum seven ply APA Group I B-B solid veneer layers free of splits and all other voids, with resin impregnated paper facings on both sides; free of add urea formaldehyde.
  5. Tempered Hardboard: ANSI A 135.4 inter-felted lignocellulosic fibers consolidated under heat and pressure; Surface 2 Sides, nominal thickness of 0.25 inch unless otherwise indicated.
- D. High-Pressure Decorative Laminate: NEMA LD3, grades as required by woodwork quality standard indicated, unless noted otherwise.
1. Basis-of-Design Product, PLAM-1:
    - a. Product: Nevamar Standard HPL by Panolam Surface Systems
    - b. Color: Gunmetal.
    - c. Pattern: S6020-T.
    - d. Finish: Standard.
    - e. Product Type: NG48;
    - f. Flame Spread and Smoke-Developed Index:
      - 1) Class C: Flame spread index 76-200; smoke developed index 0-450.
  2. Adhesive: Product recommended by countertop material manufacturer.
- E. WD-1 Solid stock paint grade lumber, dimensions as shown on drawings. Species and cut to be determined by general contractor and reviewed by architect.

## 2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
1. Comply with ANSI-BHMA A156.9, unless indicated otherwise.
  2. Provide uniform appearance in the metal finish for all hardware components.
  3. Finish to comply with BHMA A156.18.
- B. Frameless Concealed Hinges: BHMA A156.9, B01602, 170 degrees of opening, self closing.
1. 130 degree opening acceptable below glass display.
  2. Provide number of hinges required for door weight.
- C. Pulls: Back mounted, solid metal;

1. Product: DP55 Series – 5/16" dia. Rod Pull by Mockett.
  2. Length: 6-5/16".
  3. Finish: Stainless Steel.
- D. Catches: Magnetic type; Ives 325, 12 lb. pull; where required.
- E. Coat Hooks: Mocket, CH23 in stainless steel.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installation, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.
- C. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

### 3.3 INSTALLATION

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install woodwork plumb, level, true and straight with no distortions. Scribe and cut woodwork to fit adjoining work including variations in finish floors, and refinish cut surfaces or repair damaged finish at cuts. Coordinate woodwork with electrical and plumbing work.
  1. Shims: Concealed, provide as required.
  2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

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- C. Secure Work to grounds, stripping, blocking, and inserts. Use concealed fasteners and blind nailing wherever possible. Countersink, fill flush and finish exposed fasteners to match adjacent surface, unless otherwise indicated.
  - D. Architectural Woodwork: Comply with requirements, and AWI Section 6, matching grades indicated, and the following:
    - 1. Standing and Running Trim: Division A, Premium grade. Gaps behind members shall be filled and finished to match the backing surface.
    - 2. Cabinets and Casework: Division A, Premium grade.
  - E. Field Joints: Acceptable only as shown on approved submittals. Install work with the minimum number of joints possible. Cope and miter joints; stagger joints in adjacent and related members. Comply with AWI quality standards referenced for shop fabrication.
  - F. Tolerances: 1/8-inch in 8 feet for plumb and level (including tops); and with no variations in flushness of adjoining surfaces, except where referenced standard is tighter.

#### 3.4 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

- A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair replace Work. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
- C. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of substantial completion.

END OF SECTION

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## SECTION 07 84 13 - PENETRATION FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
  - 1. Walls and partitions.
  - 2. Smoke barriers.
  - 3. Construction enclosing compartmentalized areas.
- B. Related Requirements:
  - 1. Section 07 84 43 "Joint Firestopping."
  - 2. Section 09 29 00 "Gypsum Board" for fire-rated acoustical sealant.

#### 1.3 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Government's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Government's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

#### 1.4 SUBMITTAL

- A. Product Data: For each type of product indicated.
- B. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information.
  - 1. Types of penetrating items.
  - 2. Types of constructions penetrated, including fire-resistant ratings, and where applicable, thicknesses of construction penetrated.
  - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency. Include manufacturer's standard details and installation instructions.

- C. Qualification Data: For Installer.
- D. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- D. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- E. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
  - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
  - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
    - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
      - 1) UL in its "Fire Resistance Directory."
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Contractor's Quality Control."



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## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to 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 multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Engage a qualified installer to select and provide penetration firestop assemblies.
- B. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
  - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
  - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
  - 3. Fire-resistance-rated floor assemblies.
  - 4. Fire-resistance-rated roof assemblies.
- C. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:
  - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
  - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
    - a. Penetrations located outside wall cavities.
    - b. Penetrations located outside fire-resistance-rated shaft enclosures.

- c. Penetrations located in construction containing fire-protection-rated openings.
  - d. Penetrating items larger than 100-mm-diameter nominal pipe or 100 sq. cm in overall cross-sectional area.
- D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  - 2. For floor penetrations with annular spaces exceeding 100 mm (4 inches)
  - 3. in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
  - 4. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- E. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

## 2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
- 1. Permanent forming/damming/backing materials, including the following:
    - a. Slag/rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  - 2. Temporary forming materials.
  - 3. Substrate primers.
  - 4. Collars.
  - 5. Steel sleeves.

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## 2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
  - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
  - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

## 2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

### 3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

- C. Install fill materials for firestop systems by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

#### 3.4 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION

## SECTION 07 84 43 - JOINT FIRESTOPPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

## A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.
3. Bidder-design requirements.

## B. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
2. Section 09 22 16 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
  1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Qualification Data: For Installer.
- D. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

## 1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

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## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

## 1.8 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Engage a qualified installer to select and provide joint firestop assemblies and systems complying with requirements.
- B. Fire-Test-Response Characteristics:
  - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."
      - 2) Intertek Group in its "Directory of Listed Building Products."

### 2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
  - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.
  - 1. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
  - 1. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

#### 3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.



1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
  3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Designation of applicable testing agency.
  4. Date of installation.
  5. Manufacturer's name.
  6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and

remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION

## SECTION 07 92 00 - JOINT SEALANTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes joint sealants for the following applications:
  - 1. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
    - a. Control and expansion joints on exposed interior surfaces.
    - b. Vertical joints on exposed surfaces of walls and partitions.
    - c. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
    - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - e. Acoustical sealant.

## 1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

## 1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
  - 1. Include sealant schedule indicating type and color for each application for Architect's review and selection.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch (13-mm) wide joints formed between two 6-inch (150-mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Qualification Data: For Installer and testing agency.

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- G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
  - H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
    - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
    - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
  - I. Field Test Report Log: For each elastomeric sealant application.
  - J. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

#### 1.5 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 1. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints. Where joint sealants are in contact with other joint sealant types, joint sealant shall be provided by the same manufacturer.
    - a. Different manufacturers are acceptable where, prior to installation, all compatibility documentation has been submitted and the Architect has reviewed reviewed and approved the use and application of each joint type aand manufacturer change.
  - 2. Where joint sealants are in contact with joint sealant types of the same type, joint sealant shall be the same product.
- B. Preconstruction Conference: Conduct preinstallation conference at Project site and review applications, compatibility and sequencing.

#### 1.6 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  2. Disintegration of joint substrates from causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain joint sealant materials from a single manufacturer for each different product required.
- B. Joint Sealant Materials: Coordinate with other Section requirements and products; provide products complying with Project requirements; produced by a single manufacturer for each type required, and by one of the following approved Basis-of-Design manufacturers for the sealer types or component listed:
1. Urethane: Tremco, Sika, and Sonneborn.
  2. Silicone: Dow, Sonneborn, and Tremco.
  3. Preformed Hollow Neoprene Gasket: Acme Highway Products Corp., D.S. Brown Co., and Watson Bowman Associates Inc.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

### 2.3 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As indicated.

### 2.4 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing

according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

- C. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:
  - 1. Type and Grade: S (single component) and NS (nonsag).
  - 2. Class: 25.
  - 3. Use Related to Exposure: NT (nontraffic).
  - 4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

## 2.5 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
  - 1. Basis-of-Design Product: Tremco Acrylic Latex Caulk.

## 2.6 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrating by testing representative assemblies according to ASTM E 90.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
  - 1. Basis-of-Design Product: Tremco Acoustical Sealant.

## 2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: Preformed, resilient, plastic foam joint-filler strips, complying with ASTM C 717.
  - 1. Basis-of-Design Products:
    - a. Bicellular, ASTM C 1330 Type B: SOF Rod by NOMACO Inc.; [www.nomaco.com](http://www.nomaco.com).
    - b. Approved equal.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 25 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials

or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  - 2. Remove laitance and form-release agents from concrete.
    - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

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- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    - 1. Do not leave gaps between ends of sealant backings.
    - 2. Do not stretch, twist, puncture, or tear sealant backings.
    - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
  - D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
  - E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
    - 1. Place sealants so they directly contact and fully wet joint substrates.
    - 2. Completely fill recesses in each joint configuration.
    - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
  - F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
    - 1. Remove excess sealant from surfaces adjacent to joints.
    - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
    - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
  - G. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.
  - H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.
  - I. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.3 JOINT-SEALANT SCHEDULE
- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
    - 1. Joint Locations:
      - a. Control joints on exposed interior surfaces of exterior walls.



- b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances not specified in other Sections.
    - c. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Acrylic latex.
  - 3. Joint-Sealant Color: As selected by Architect.
- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
  - 3. Joint-Sealant Color: As selected by Architect.
- C. Joint-Sealant Application: Interior control joints and perimeter of gypsum walls.
  - 1. Refer to Section 09 29 00 "Gypsum Board".
- D. Joint-Sealant Application:
  - 1. Interior joints in rated partitions exposed to view.
    - a. Refer to Section 09 29 00 "Gypsum Board".

END OF SECTION

## SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes hollow-metal doors and frames.
- B. Related Requirements:
  - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

## 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

## 1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

## 1.6 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type.

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2. Details of doors, including vertical and horizontal-edge details and metal thickness.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of anchorages, joints, field splices, and connections.
  7. Details of moldings, removable stops, and glazing.
  8. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
- D. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- E. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- F. Product Test Reports: For each type of frame assembly, for tests performed by a qualified testing agency.
- G. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
    1. Provide additional protection to prevent damage to factory-finished units.
  - B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
  - C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each unit to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

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## 2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

## 2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A. At interior locations as scheduled.
  - 1. Doors:
    - a. Type: As indicated in the Door Schedule.
    - b. Thickness: 1-3/4 inches (44.5 mm).
    - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053.
    - d. Edge Construction: Model 1, Full Flush.
    - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion. Steel stiffeners are not permitted where telegraphing through door facing and shall be rejected.
  - 2. Frames:
    - a. Materials: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch (1.3 mm).
    - b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
    - c. Construction: Face welded.
  - 3. Exposed Finish: Prime.

## 2.4 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).

3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

## 2.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
  1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- J. Metal-Patching Compound: Two-part, polyester-resin metal-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated because of corrosion. Filler shall be capable of filling deep holes and spreading to feather edge. Provide Bondo by 3M or equal.

## 2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

**B. Hollow-Metal Doors:**

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation. Steel stiffeners or their attachment shall not telegraph through face.
2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
  - a. Provide closure profiles required for acoustical door hardware. Coordinate requirements with Section 08 71 00.
6. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

**C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.**

1. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
    - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
    - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
    - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
    - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

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- b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
    - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
    - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
    - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
    - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
  - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
- 5. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
  - 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  - 7. Terminated Stops: Terminate stops [6 inches (152 mm)] above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
- 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
  - 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  - 3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  - 4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
- 1. Reinforce frames to receive nontemplated, mortised, and surface-mounted hardware.
  - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

## 2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap frames to receive nontemplated, mortised, and surface-mounted hardware.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint



- continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
- c. Install frames with removable stops located on secure side of opening.
  - d. Install door silencers in frames before grouting.
  - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
  - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
  3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
  5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  6. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
  7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
    - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
    - c. At Bottom of Door: As indicated on Drawings.
    - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

## SECTION 08 71 00 - DOOR HARDWARE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes:
  - 1. Mechanical door hardware for the following:
    - a. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Section 08 11 13 "Hollow Metal Doors and Frames."

## 1.3 REFERENCES

- A. Codes: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- B. Standards: All hardware specified herein shall comply with the following industry standards:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series.
  - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

## 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

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- B. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
  2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  3. Content: Include the following information:
    - a. Type, style, function, size, label, hand and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastening and other pertinent information.
    - d. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
  5. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
- C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Warranty: Special warranty specified in this Section.
- E. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

## 1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented commercial experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

- B. Installer Qualifications: A minimum 3 years documented commercial experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented commercial experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner's Authorized Representative concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type of door hardware from a single manufacturer.
- E. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- F. Preinstallation Conference: Conduct conference at Project Site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Inspect and discuss preparatory work performed by other trades.
  - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
  - 4. Review sequence of operation for each type of electrified door hardware.
  - 5. Review required testing, inspecting, and certifying procedures.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

## 1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified

hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

## 1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Special Warranty Periods:
  - 1. Mortise Locks and Latches: Ten years from date of Substantial Completion.
  - 2. Exit Hardware: Five years from date of Substantial Completion.
  - 3. Manual Surface Door Closer Bodies: Twenty five years from date of Substantial Completion.
  - 4. Heavy-Duty Floor Closers: Ten years from date of Substantial Completion.
  - 5. Shallow Depth Floor Closers: Two years from date of Substantial Completion.
  - 6. Electromechanical Door Hardware: Two years from date of Substantial Completion.

## 1.9 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

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## PART 2 - PRODUCTS

### 2.1 OSU REQUIREMENTS

- A. Any key locking devices e.g., programmers, interrogators, junction boxes, etc. must be capable of accepting an OSU – supplied lock.
- B. For renovation projects the OSU Project Manager is responsible for contacting the local jurisdiction's Fire Marshal to determine if the installation of a Knox Box is required.
- C. All exit devices shall be approved by the OSU Access, Lock and Key Shop (AL&KS) prior to installation.
- D. Fully automatic doors for main entrance, ADA accessible doors for all other doors should have proximity sensors placed at an accessible appropriate location and centered 33 inches above finished floor surface.
- E. All new hardware shall be supplied with Best cylinders.
- F. OSU AL&KS shall make provisions for pinning for lock cylinders.
- G. For all remodel projects, the existing hardware shall be matched with existing building hardware unless that hardware is no longer available. If unavailable refer to the OSU AL&KS.
- H. All SCHLAGE cylindrical lock-sets shall be "93K" ("14D" Lever) series, ADA compliant.
- I. All SCHLAGE cylindrical lock-sets shall be ND series (Sparta Design), ADA compliant.
- J. Partial renovations which only require some rekeys will be placed on the building's existing system.
- K. Major renovations which will require the majority of the doors to be rekeyed need to be evaluated by the OSU Access, Lock and Key Shop for system selection prior to ordering cores.

### 2.2 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with OSU requirements and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations.

- C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the Architect, Owner's Authorized Representative, and their designated consultants.

## 2.3 HANGING DEVICES

- A. Hinges: Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
  - a. Quantity: Provide the following hinge quantity, unless otherwise indicated:
    - b. Two Hinges: For doors with heights up to 60 inches.
    - c. Three Hinges: For doors with heights 61 to 90 inches.
    - d. Four Hinges: For doors with heights 91 to 120 inches.
    - e. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  - 4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
    - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all outswinging lockable doors.
  - 5. Acceptable Manufacturers:
    - a. Hager Companies (HA).
    - b. McKinney Products (MK).

## 2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
  - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  - 2. Furnish dust proof strikes for bottom bolts.
  - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
  - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.



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5. Acceptable Manufacturers:
    - a. Rockwood Manufacturing (RO).
    - b. Trimco (TC).
  
  - B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
    1. Acceptable Manufacturers:
      - a. Rockwood Manufacturing (RO).
      - b. Trimco (TC).
  
  - C. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
    1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
    2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
    3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
    4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
    5. Acceptable Manufacturers:
      - a. Rockwood Manufacturing (RO).
      - b. Trimco (TC).
  
  - D. Locking Pull System: Post-mount style door pulls with integrated deadbolt locking system in type and design as specified in the Hardware Sets. Pulls available in multiple head, floor, or combination locking options, with outside keyed rim cylinder operation and inside turn piece activation. Mounting applications for aluminum, glass, steel and wood doors, with customized sizing and configuration options. Pull finishes include brass, bronze, and stainless steel.
    1. 1. Acceptable Manufacturers:
      - a. Rockwood Manufacturing (RO) – LP Series.

## 2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years commercial experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
  1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  5. Keyway: Match Facility Restricted Keyway.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  3. Existing System: Key locks to Owner's existing system.
- F. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
  2. Master Keys (per Master Key Level/Group): Five (5).
  3. Construction Keys (where required): Ten (10).
- G. Construction Keying: Provide construction master keyed cylinders.
- H. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
  2. Provide transcript list in writing or electronic file as directed by the Owner.
- I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with selflocking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Acceptable Manufacturers:
    - a. Lund Equipment (LU).
    - b. MMF Industries (MM).
    - c. Telkee (TK).
- J. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into "Key Wizard" software.

## 2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field reversible for handing without disassembly of the lock body.
1. Acceptable Manufacturers:

- a. Stanley Best (BE) – 40H Series.
- B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
  - 1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
  - 2. Locks are to be non-handed and fully field reversible.
  - 3. Acceptable Manufacturers:
    - a. Stanley Best (BE) – 9K Series.

## 2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
  - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
  - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
  - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  - 4. Dustproof Strikes: BHMA A156.16.

## 2.8 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
  - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
  - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
  - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
  - 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  - 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
  1. Acceptable Manufacturers:
    - a. LCN Closers (LC) - 4040XP Series.
- C. Door Closers, Overhead Concealed (Heavy Duty): ANSI/BHMA 156.4 certified Grade 1 heavy duty door closers with closers with complete spring power adjustment, sizes 1 thru 6. Closers to have fully concealed body in the frame head and track assembly in the door, rack and pinion type construction, either offset or center hung applications, with separate and independent valves for closing speed, latch speed, and backcheck adjustments. Overhead concealed closers require a minimum 4-inch frame head for mounting.
  1. Acceptable Manufacturers:
    - a. LCN Closers (LC) - 2010 Series.
    - b. Norton Door Controls (NO) - 7900 Series.

## 2.9 ARCHITECTURAL TRIM

- A. Door Protective Trim
  1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
  2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
  3. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
    - a. Stainless Steel: 300 grade, 050-inch thick.
  4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
  5. Acceptable Manufacturers:
    - a. Rockwood Manufacturing (RO).
    - b. Trimco (TC).

## 2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  - 1. Acceptable Manufacturers:
    - a. Rockwood Manufacturing (RO).
    - b. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  - 1. Acceptable Manufacturers:
    - a. Rixson Door Controls (RF).
    - b. Rockwood Manufacturing (RO).
    - c. Sargent Manufacturing (SA).

## 2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
  - 1. Pemko Manufacturing (PE).
  - 2. Reese Enterprises, Inc. (RE).
  - 3. Zero (ZE).

## 2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.13 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.

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2. Custom Steel Doors and Frames: HMMA 831.
  3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as [indicated in keying schedule] [directed by Owner].
  2. Furnish permanent cores to Owner for installation.
- E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- 3.4 FIELD QUALITY CONTROL
- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

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### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the Architect and Owner's Authorized Representative. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Architect or Owner's Authorized Representative with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. See Drawings for hardware sets.
- C. Manufacturer's Abbreviations:
  - 1. MK - McKinney
  - 2. RF - Rixson
  - 3. RO - Rockwood
  - 4. IV - Ives
  - 5. BE - Stanley Security Solutions Inc (BE)
  - 6. SH - Schlage Electronic Security
  - 7. VD - Von Duprin
  - 8. HS - HES
  - 9. LC - LCN Closers
  - 10. PE - Pemko

END OF SECTION 08 71 00



## SECTION 08 80 00 - GLAZING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes:
  - 1. Glass for insulated glazed assemblies (GL-1).
  - 2. Glazing sealants and accessories.
  - 3. Glazing schedule.
- B. Related Requirements:
  - 1. Section 06 40 00 "Architectural Woodwork" for glass for display case fabrications.
  - 2. Section 08 11 13 "Hollow Metal Doors and Windows".

## 1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

## 1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for glazing during and after installation.

## 1.6 SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

- C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency and sealant testing agency.
- F. Product Certificates: For glass.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Product Approval: Provide appropriate product approvals issued by either Miami-Dade County or State of Oregon indicating that the specified glazed aluminum curtain wall and window wall system is approved as "Large and/or Small Missile Impact Resistant as applicable" and is approved for use without the requirements of additional impact protection.
  - 1. Labeling: Each unit of curtain wall systems shall bear label with manufacturer's name or logo, city, state, and the product approval information.
- E. Compatibility: Contractor shall confirm substrates and surfaces receiving glazing materials shall be compatible with one another and compatible with materials in place at the time of installation.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

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## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.

### 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
  - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
  - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

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## 2.4 GLASS PRODUCTS

- A. Insulated glazing unit (GL-1). Provide glazing unit that meets the following requirements where applicable and as required by current building code:
1. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
  2. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  3. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  4. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  5. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
  2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- C. Adhesive Glazing Tape and Foam Tapes: Preformed, adhesive tape for applications indicated.
1. Basis-of-Design Product: VHB Tapes by 3M; [multimedia.3m.com](http://multimedia.3m.com).
    - a. Family: As recommended by manufacturer in writing for substrates and applications indicated.

## 2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep systems.
  - 3. Minimum required face and edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

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### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

## 3.7 GLAZING SCHEDULE

- A. Glazing Type GL-1: Structural, monolithic interior single lites.
  - 1. Fully tempered 1/4 inch (6 mm) clear float glass.
  - 2. Safety glazing required.
  - 3. Insulated.

END OF SECTION



## SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

## A. Section Includes:

- 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

## B. Related Requirements:

- 1. Division 8 "Openings" Sections for coordinating opening requirements.
- 2. Section 09 21 16 "Gypsum Board Shaft Wall Assemblies" for vertical and horizontal shaft wall assemblies.
- 3. Division 21 "Fire Suppression" Sections for fire sprinkler work to be coordinated with soffit framing and ceiling suspension systems.
- 4. Division 23 "HVAC" Sections for ducts, diffusers and other mechanical work to be coordinated with soffit framing and ceiling suspension systems.
- 5. Division 26 "Electrical" Sections for lighting work to be coordinated with soffit framing and ceiling suspension systems.
- 6. Division 28 "Electrical Safety and Security" Sections for fire alarm work to be coordinated with soffit framing and ceiling suspension systems.

## 1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Certificates: For each type of code-compliance certification for studs and tracks.
- C. Evaluation Reports: For post-installed and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

## 1.4 COORDINATION

- A. Coordination of Wall Support With Building Structure and Other Building Systems: Where direct anchorage to building structure is impractical due to dimensional restriction, conflict with HVAC, plumbing, electrical or other considerations confirm attachment with Architect. Coordinate with HVAC, Plumbing, electrical fire protection

and all other building systems to identify potential areas of conflict for ceiling anchorage and prepare engineered solution in advance of installation.

1. Do not attach metal framing to plenum construction.
- B. Coordinate blocking requirements for all wall and soffit mounted items in other Sections. Installer shall provide blocking at all locations where items are attached to walls and soffits.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

### 2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
  2. Protective Coating: ASTM A 653/A 653M, G40 (Z120) hot-dip galvanized unless otherwise indicated.
    - a. Provide G60 (Z180) where adjacent to and in the same cavity as exposed exterior framing, attached to concrete or CMU.
- C. Studs and Runners: ASTM C 645.
1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: As indicated on Drawings.
    - b. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: As indicated.
1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

- E. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
  - 2. Depth: As indicated on Drawings.
- G. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
  - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
  - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
    - a. Type: Cast-in-place anchor.
  - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.

- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
  - 1. Depth: As indicated on Drawings.
- F. Furring Channels (Furring Members):
  - 1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
  - 2. Steel Studs and Runners: ASTM C 645.
    - a. Minimum Base-Metal Thickness: As indicated on Drawings.
    - b. Depth: As indicated on Drawings.
  - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
    - a. Minimum Base-Metal Thickness: As indicated on Drawings.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

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### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
  - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
  - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
  - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  - 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

- c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- E. Direct Furring:
1. Screw to wood framing.
  2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Z-Furring Members:
1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
  2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
  3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches (1219 mm) o.c.
  2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
  3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

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2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

## SECTION 09 29 00 - GYPSUM BOARD

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Acoustical sealant.
  - 3. Acoustic insulation.
  - 4. Finishing.
- B. Related Requirements:
  - 1. Section 06 10 00 "Rough Carpentry" for coordination with framing and blocking.

## 1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
- C. Shop Drawings: For casing beads, moldings, panel transitions and closure profiles.
  - 1. Include elevations showing typical and unique conditions, openings, reveals, panel edges, control and expansion joints and transitions.
  - 2. Show details of special conditions and Project specific details.
  - 3. Show details of wall closures and terminations, including acoustical wall closures.

## 1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Build mockups for the following:
    - a. Level 4 of gypsum board finish indicated for use in exposed locations.
    - b. As associated with the wall paneling or applied finishes.
  - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  - 3. Simulate finished lighting conditions for review of mockups.



4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

#### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Approved Manufacturers:
  1. American Gypsum; [www.americangypsum.com](http://www.americangypsum.com).
  2. CertainTeed Corp.; [www.certainteed.com](http://www.certainteed.com).
  3. Georgia Pacific; [www.gp.com](http://www.gp.com).
  4. National Gypsum Co.; [www.nationalgypsum.com](http://www.nationalgypsum.com).
  5. PABCO Gypsum; [www.pabco gypsum.com](http://www.pabco gypsum.com).
  6. United States Gypsum Co. (USG); [www.usg.com](http://www.usg.com).
  7. Products listed in UL assemblies and required for rated-wall assemblies.

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## 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard, General: Do not provide 1/2 inch (12.7 mm), regular type gypsum board at walls. All gypsum wall board material is to be type 'X' and 5/8" thickness unless otherwise indicated.
- B. Gypsum Board, Type X (GWB): ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
  - 3. Applications: Provide at the following locations and others as indicated:
    - a. All walls scheduled for gypsum wall board.
    - b. Rated partitions.
    - c. Rated ceilings and soffits.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M. Sag-resistant.
  - 1. Thickness: 1/2 inch (12.7 mm).
  - 2. Long Edges: Tapered.
  - 3. Applications: Provide at the following locations and others as indicated:
    - a. Ceiling and soffit finishes indicated, non-rated.
- D. Impact-Resistant Gypsum Board (IR-GWB): ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
  - 1. Core: 5/8 inch (15.9 mm), Type X, as indicated in Drawings.
  - 2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
  - 3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
  - 4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
  - 5. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
  - 6. Long Edges: Tapered.
  - 7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- E. Moisture- (Mold-) Resistant Gypsum Board (GWB-MR): ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
  - 1. Core: 5/8 inch (15.9 mm), Type X, as indicated in Drawings.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
  - 4. Application: Moisture- (mold-) resistant gypsum board shall be provided in lieu of regular gypsum wall board at all backsplash and surrounding areas of sinks,

lavatories, drinking fountains and mop sinks, to a distance not less than 18 inches from edge of sinks, lavatories and mop sinks.

5. Applications: Provide at the following locations and others as indicated:
  - a. Walls adjacent to water fountains and water coolers.
  - b. Walls within Janitor or Custodial Closets.
  - c. Walls adjacent to lavatories and sinks unless tile finish is indicated.

## 2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
  1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
  2. Long Edges: Tapered.

## 2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
  1. Thickness: 5/8 inch.
  2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
  2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.
    - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - e. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
  1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
  2. Finish:
    - a. Where indicated to be field-painted: Corrosion-resistant primer compatible with joint compound and finish materials specified.
    - b. Where indicated to be factory-painted: Baked-enamel finish.
    - c. Where indicated to retain factory anodized finish: Class II anodic finish.

3. Basis-of-Design Manufacturers:
  - a. Fry Reglet; [www.fryreglet.com](http://www.fryreglet.com).
  - b. Milgo Bufkin; [www.milgo-bufkin.com](http://www.milgo-bufkin.com).
4. Basis-of-Design Products:
  - a. ALUM Z-REVEAL: As selected by Architect, by Fry Reglet.

## 2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Board: Fiberglass mesh.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
  4. Finish Coat: For third coat, use drying-type, all-purpose compound.
  5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Tile Backing Panels:
  1. Cementitious Backer Units: As recommended by backer unit manufacturer and compatible with tile applications. Do not use gypsum compound.

## 2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  1. For panels attached to heavy gauge cold-formed metal framing specified in Section 05 40 00 "Cold-Formed Metal Framing" use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

- D. Acoustic Insulation:
1. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  2. Thickness: Fill stud cavity; friction fit.
  3. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  4. Basis-of-Design Product: Sound Attenuation Batts by Owens Corning; [www.owenscorning.com](http://www.owenscorning.com).
    - a. Thickness: As required to fill stud cavity in friction-fit application.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90. Coordinate with Section 07 92 00 "Joint Sealants" requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.

- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
  - 1. Comply with manufacturer's installation instruction for installing acoustic gypsum board panels.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: All vertical surfaces, including where required for fire-resistance-rated assembly, unless otherwise indicated.
  - 2. Ceiling Type: Ceiling surfaces.
  - 3. Impact-Resistant Type: As indicated on Drawings.
  - 4. Moisture- (Mold-) Resistant Type: As indicated on Drawings.
  - 5. Type C: Where required for specific fire-resistance-rated assembly indicated.
  - 6. Glass-Mat Interior Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

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2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
  2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
  4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
    - a. Exception: Where required by Code for fire-resistance-rated assemblies, fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- 3.4 APPLYING TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
  - B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces. Do not provide glass-mat or cementitious backer units at locations indicated to receive paint finish. Provide transition from tile backing panels to other panels at tile and paint finish interfaces.
  - C. Do not install gypsum board joint compound on tile backing panel joints.

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### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
  - 1. Locate trim profiles in approved shop drawing submittal.
- B. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners unless otherwise indicated.
  - 2. LC-Bead: Use at exposed panel edges.
  - 3. L-Bead: Use where indicated.
  - 4. U-Bead: Use where indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile and acoustical tile, and elsewhere as indicated on Drawings.
  - 3. Level 3: Panels that are to receive wall panels, fiber reinforced plastic finish, heavy wallcoverings, and elsewhere as indicated on Drawings.
  - 4. Level 4: At panel surfaces without wall coverings, and that will be exposed to view unless otherwise indicated, or panels that are to receive light-textured finishes before painting or light wallcoverings, and elsewhere as indicated on Drawings.
    - a. Primer and its application to surfaces are specified in Section 09 91 00 "Interior Painting."



5. Level 5: At panel surfaces that will be exposed to view and will receive gloss and semigloss paint finishes, surfaces subject to wall-wash illumination, surfaces scheduled for applied wall graphics, and elsewhere as indicated on Drawings.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions. Do not apply gypsum joint compound. Coordinate with Section 09 30 00 "Tiling" requirements.

### 3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

## SECTION 096253 – SYNTHETIC TURF FLOORING, O.F.O.I.

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Synthetic Turf Flooring will be owner furnished, owner installed. Specification Section is included for reference only.
- B. Furnishing, delivery, installation and warranty of a complete indoor synthetic turf system including resilient infill material.

## 1.2 REFERENCES

- A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):
  1. ASTM D1335 Tuft Bind
  2. ASTM D5034 Tear Strength
  3. ASTM F2765 Lead Content
  4. ASTM D1577 Total Yarn Linear Density
  5. ASTM D2256 Yarn Breaking Strength
  6. ASTM D7138 Yarn Melting Point
  7. ASTM D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine
  8. ASTM D5116: Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
  9. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring
  10. ASTM F1514: Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change
  11. ASTM F2772: Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems
  12. ASTM D2859 Flammability
  13. ASTM F355 Impact Attenuation
  14. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
  15. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- B. ASTM F2772: Standard Specification for Athletic Performance Properties of Indoor Sports Floors South Coast Air Quality Management District (SCAQMD) Rule #1168 (VOC standards for adhesive and sealant applications).
  1. VOC standards for adhesive and sealant applications

## 1.3 SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- C. Samples: Submit verification samples for finishes, colors, and textures.
- D. Quality Assurance Submittals: Qualification Data for installer.
- E. Closeout Submittals: Submit the following:
  - 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
  - 2. Warranty: Warranty documents specified herein.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
  - 2. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions, and manufacturer's warranty requirements.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 requirements.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

#### 1.6 FIELD CONDITIONS

- A. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
- B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

**1.7 WARRANTY**

- A. The Contractor shall provide a minimum five (5) year warranty policy by the manufacturer against defects in materials and workmanship. Defects shall include, but not be limited to, ultraviolet ray fading, degradation, or excessive wear of fiber.

**1.8 CONTACT**

- A. David Sides, Salses Director, Ecore Athletic  
PH: 415 309 4317  
Email: david.sides@ecoreintl.com

**PART 2 - PRODUCTS****2.1 MANUFACTURER:**

- A. Basis-of-Design Manufacturer: Ecore  
1. Address: 715 Fountain Ave., Lancaster, PA 17601: Telephone: (800) 322-1923, (717) 295-3400: Fax (717) 295-3414; Email: [info@ecoreathletic.com](mailto:info@ecoreathletic.com)

**2.2 PRODUCTS:**

- A. Basis-of-Design Product: Ecore Training Ground with Nike Grind TurfX and Adhesives, manufactured by Ecore, for indoor fitness applications.
1. Ecore TurfX, consisting of a 10mm SmashPad underlayment, installed under a 25mm polyethylene turf surface wear layer.
  2. E-grip III, a one-component polyurethane adhesive.
  3. Colors and Patterns: Monolithic Black 9999
  4. Synthetic Turf System shall possess the following characteristics:

<b>Performance Criteria</b>	<b>Test Method</b>	<b>Result</b>
Tuft Bind	ASTM D-1335	>8 lbs.
Tear Strength Average	ASTM D-5034	>200 lbs.
Lead Content	ASTM F-2765	<50 ppm
Total Yarn Linear Density	ASTM D-1577	12,240 Denier
Yarn Breaking Strength	ASTM D-2256	>19 lbs.
Yarn Melting Point	ASTM D-7138	248 F
Flammability	ASTM D-2859	Pass
Pill Test	ASTM D-2859	Pass
Coefficient of Friction	ASTM D 2047	0.35
V.O.C. Compliant	ASTM D 5116	Pass
Chemical Resistance	ASTM F-925	Pass
Resistance to Heat	ASTM F 1514	$\Delta E < 0.8$
Impact Attenuation	ASTM F355	63
Vertical Deflection/ Deformation	ASTM F 2772	8.38mm
Surface Effect Slip	ASTM F 2772	Pass 91 BPV

Resistance		
Force Reduction	ASTM F 2772	61.4%

B. SYNTHETIC GLUE MATERIAL

1. Any adhesive products required for the installation of a proposed turf system shall be purpose suited to the system. The material and application methods shall be as recommended by the adhesive manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation of the synthetic turf system is to comply with the manufacturer's recommendations, requirements and the reviewed and approved shop drawings.
- B. Perform all work in strict accordance with the Contract Documents and the manufacturer's specifications and instructions. Only those skilled technicians proposed in the bid phase are to be assigned to this project by the Contractor.
- C. The designated Supervisor for the Synthetic Turf Installer must be present during any and all construction activity associated with the field installation, including testing, cleanup and training.
- D. All products and equipment are to be from sources approved by the authorized turf manufacturer and conform to the specifications.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions and as noted below.
- B. Surface Preparation:
  1. Existing Wood Athletic Flooring is to remain and serve as a substrate for the Synthetic Turf Flooring. Remove all wood flooring coatings, finishes, and other substances that are incompatible with adhesives using mechanical methods recommended by Synthetic Turf Flooring manufacturer.

### 3.4 TURF INSTALLATION

- A. Install Synthetic Turf Flooring system in accordance with the manufacturer's written installation instructions.
- B. All terminations shall be as detailed and approved in the shop drawings.

### 3.5 CLEANING AND PROTECTION

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- B. Protection: Protect installed product and finished surfaces from damage during construction.

END OF SECTION 09 62 56

## SECTION 09 65 00 - RESILIENT FLOORING AND ACCESSORIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Marmoleum composite sheet flooring (RES-1).
  - 2. Resilient (rubber) base (RB-1).
  - 3. Resilient molding and installation accessories.

## 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Submit shop drawings showing layout, finish colors, patterns and textures.
- C. Samples for Initial Selection: For moldings and accessories.
  - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.
- D. Samples for Verification: For each type of product and finish indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.
- E. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Maintenance data for installed products in accordance with Division 1 sections. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
- B. Warranty: Warranty documents specified herein

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

## 1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide resilient accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.

- B. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

- 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F 10 deg C or more than 90 deg F (32 deg C).

#### 1.8 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient materials during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

#### 1.9 SEQUENCING AND SCHEDULING

- A. Finishing Operations: Install flooring after finishing operations, including painting and ceiling operations etc., have been completed.

#### 1.10 WARRANTY

- A. Manufacturer's Materials Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
  - 1. Warranty Period: 1 year limited warranty commencing on Date of Substantial Completion. Notice of any defect must be made in writing to manufacturer within thirty (30) days after buyer learns of the defect.
- B. Limited Wear Warranty: Manufacturer's limited wear warranty of five years for heavy commercial traffic.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.



## 2.2 MARMOLEUM COMPOSITE FLOORING

- A. Basis-of-Design Products: By Forbo; [www.forbo.com](http://www.forbo.com).
  - 1. RES-1: Marmoleum.
    - a. Pattern: Cirrus.
    - b. Color: Grey Iron 3328.
    - c. Size: 79"W, 1/10" Gauge.
    - d. Installation: Verify with manufacturers recommendations for concrete substrate.

## 2.3 RESILIENT WALL BASE, RB-1

- A. Basis-of-Design Product, Rubber Base: Pinnacle Rubber by Roppe; [roppe.com](http://roppe.com).
- B. Color: No. 148 "Steel Gray."
- C. Style:
  - 1. Cove for hard-surface floor applications.
  - 2. Straight for carpet application.
- D. Minimum Thickness: 0.125 inch (3.2 mm).
- E. Height: 4 inches, or as selected by Architect.
- F. Lengths: Cut lengths 48 inches (1200 mm) long or coils in manufacturer's standard length.
- G. Outside Corners: Premolded.
- H. Inside Corners: Premolded.
- I. Surface: Smooth.

## 2.4 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications; reducer strip for resilient floor covering; joiner for tile and carpet; transition strips.
- B. Material: Rubber.
- C. Profile and Dimensions: As indicated.

## 2.5 THRESHOLD

- A. Description: Rubber door threshold.
- B. Material: Rubber
- C. Manufacturer: Roppe
- D. Product: #33 Full Thresdhold
- E. Color: TBD.

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## 2.6 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
  - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Cove Base Adhesives: 50 g/L.
    - b. Rubber Floor Adhesives: 60 g/L.
- C. Seamless-Installation Accessories:
  - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
    - a. Colors: Match flooring, or as selected by Architect in Submittals.
- D. Polish: Provide protective, liquid floor-polish products recommended by flooring manufacturer.
- E. Primer: As recommended by flooring and accessory manufacturer for substrate indicated.
- F. Sealant: As recommended by resilient manufacturer for application indicated. Comply with Section 07 92 00 "Joint Sealants."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor coverings until they are same temperature as space where they are to be installed.
  1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

### 3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing floor coverings and products listed.
- B. Install underlayment following underlayment manufacturer's written instructions.
- C. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- D. Lay out resilient sheet flooring as follows:
  1. Maintain uniformity of flooring direction.
  2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
  3. Match edges of flooring for color shading at seams.
  4. Avoid cross seams.
- E. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- F. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- G. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- H. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- I. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
- J. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

- K. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- L. Seamless Installation:
  - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

### 3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Install continuous sealant bead at toe of coved base at hard surfaces.
- D. Install continuous sealant to fill gap at bottom of wall assemblies where gaps occur at all base locations.
- E. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- F. Do not stretch wall base during installation.
- G. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- H. Premolded Corners: Install premolded corners before installing straight pieces.
- I. Job-Formed Corners: Where approved by Architect.
  - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

### 3.5 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

### 3.6 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.

2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
  - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
- C. Replace damaged or installed units and accessories not complying with requirements.

END OF SECTION

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**SECTION 09 65 66 – RESILIENT ATHLETIC FLOORING, O.F.O.I.****PART 1 - GENERAL****1.1 SUMMARY**

- A. Resilient Athletic Flooring will be owner furnished, owner installed. Specification Section is included for reference only.
- B. Furnishing, delivery, installation and warranty of a complete resilient athletic floor system.

**1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  1. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
  2. ASTM D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine.
  3. ASTM D2859: Standard Test Method for Ignition Characteristics of Finished Textile Floor Coverings
  4. ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance
  5. ASTM D5116: Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
  6. ASTM E90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
  7. ASTM E492: Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
  8. ASTM E2179: Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors
  9. ASTM F137: Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus
  10. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring
  11. ASTM F1514: Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change
  12. ASTM F1515: Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change
  13. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
  14. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
  15. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

16. ASTM F2772: Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems.
17. ASTM F355 Standard Test Method for Impact Attenuation of Playing Surface Systems and Materials

### 1.3 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide recycled rubber resilient flooring, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- C. Samples: Submit verification samples for finishes, colors, and textures.
- D. Quality Assurance Submittals: Qualification Data for installer.
- E. Closeout Submittals: Submit the following:
  1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
  2. Warranty: Warranty documents specified herein.

### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
  2. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions, and manufacturer's warranty requirements.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 requirements.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

- D. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

## 1.7 FIELD CONDITIONS

- A. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
- B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

## 1.8 WARRANTY

- A. The Contractor shall provide a minimum five (5) year warranty policy by the manufacturer against defects in materials and workmanship.

## 1.9 CONTACT

- A. David Sides, Sales Director, Ecore Athletic  
PH: 415 309 4317  
Email: david.sides@ecoreintl.com

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER:

- A. Basis-of-Design Manufacturer: Ecore
  - 1. Address: 715 Fountain Ave., Lancaster, PA 17601; Telephone: (800) 322-1923, (717) 295-3400; Fax (717) 295-3414; Email: [info@ecoreathletic.com](mailto:info@ecoreathletic.com)

### 2.2 PRODUCTS:

- A. Basis-of-Design Product: Ecore Training Ground with Nike Grind RubberX and Adhesives, manufactured by Ecore, for indoor fitness applications.
  - 1. Ecore RubberX, consisting of a 10mm SmashPad underlayment, installed under a 8mm 8032 underlayment, which is fusion bonded to a 2.5mm EPDM surface wear layer.
  - 2. E-grip III, a one-component polyurethane adhesive.
  - 3. Colors and Patterns: All Star TG559



4. Resilient Athletic Floor shall possess the following characteristics:

<b>Performance Criteria</b>	<b>Test Method</b>	<b>Result</b>
Tensile Strength	ASTM D 412	300 psi min
Flexibility ¼" mandrel	ASTM F 137	Pass
Coefficient of Friction	ASTM D 2047	>0.8
V.O.C. Compliant	ASTM D 5116	Pass
Color Stability	ASTM F-1515	$\Delta E < 0.8$
Chemical Resistance	ASTM F-925	Pass
Abrasion Resistance	ASTM D 3389 / EN649	< 1g, 1,000 cycles
Resistance to Heat	ASTM F 1514	$\Delta E < 0.8$
Pill Test	ASTM D 2859	Pass
Impact Attenuation	ASTM F355	102
Vertical Deflection / Deformation	ASTM F 2772	Pass – 3.07mm
Surface Effect Slip Resistance	ASTM F 2772	Pass – 98 BPV
Ball Rebound	ASTM F 2772	Pass – 97.8%
Force Reduction	ASTM F 2772	39.3%
STC	ASTM E90	50
IIC	ASTM E492	56
$\Delta$ IIC	ASTM E2179	29

B. SYNTHETIC GLUE MATERIAL

1. Any adhesive products required for the installation of a proposed turf system shall be purpose suited to the system. The material and application methods shall be as recommended by the adhesive manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation of the synthetic turf system is to comply with the manufacturer's recommendations, requirements and the reviewed and approved shop drawings.
- B. Perform all work in strict accordance with the Contract Documents and the manufacturer's specifications and instructions. Only those skilled technicians proposed in the bid phase are to be assigned to this project by the Contractor.
- C. The designated Supervisor for the Synthetic Turf Installer must be present during any and all construction activity associated with the field installation, including testing, cleanup and training.
- D. All products and equipment are to be from sources approved by the authorized turf manufacturer and conform to the specifications.

### 3.2 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed, are acceptable for product installation in accordance with manufacturer's instructions.

### 3.3 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions and as noted below.
- B. Surface Preparation:
  - 1. Existing Wood Athletic Flooring is to remain and serve as a substrate for the Synthetic Turf Flooring. Remove all wood flooring coatings, finishes, and other substances that are incompatible with adhesives using mechanical methods recommended by Synthetic Turf Flooring manufacturer.

### 3.4 FLOORING INSTALLATION

- A. Install Resilient Athletic Flooring system in accordance with the manufacturer's written installation instructions.
- B. All terminations shall be as detailed and approved in the shop drawings.

### 3.5 CLEANING AND PROTECTION

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- B. Protection: Protect installed product and finished surfaces from damage during construction.

END OF SECTION 096566

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**SECTION 09 80 00 - ACOUSTICAL TREATMENT AND FABRIC WRAPPED PANELS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section includes:
  - 1. Acoustic ceiling panel (ACP-3).
  - 2. Acoustic wall panel (AWP-1).
  - 3. Acoustic wall panel (AWP-2).
  - 4. Fabric wrapped seat cushion (FWP-2)

**1.3 SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For unit assembly and installation.
  - 1. Include plans, elevations, sections, and mounting devices and details.
  - 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base and wall intersections. Indicate panel edge profile and core materials.
  - 3. Include details at cutouts and penetrations for other work.
  - 4. Include direction of fabric weave and pattern matching.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
  - 1. Acoustical Panel: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- (150-mm-) long Samples of each type, finish, and color.

**1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For finishes to include in maintenance manuals. Include manufacturer's written cleaning and stain-removal instructions.

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## 1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain each type of fabric covering and panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the project.
- B. Installer Qualifications: engage an experienced installer to perform Work of this Section who has specialized in installing acoustical treatment similar to those required for this Project.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Maintain 55-70 degrees F and a relative humidity of 65-75% for 48 hours before, during and after installation.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.
- D. Field Measurements: Check actual wall surfaces by accurate field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A.
  - 2. Smoke-Developed Index: 450 or less.

### 2.2 MANUFACTURERS

- A. Source Limitations: Obtain acoustic panels from single source for each type indicated.

### 2.3 ACOUSTIC CEILING PANEL, ACP-3.

- A. Basis-of-Design Product: TECTUM Finale Ceiling Panel by Armstrong, [www.armstrongceilings.com](http://www.armstrongceilings.com)
  - 1. Thickness: 2 inch.
  - 2. Size: As indicated on drawings.
  - 3. Edge Profile: Square.

4. Color: Paint As indicated on drawings.

B. Installation Method: Mechanically fastened per manufacturer's recommendation.

#### 2.4 ACOUSTIC WALL PANEL, AWP-1.

A. Basis-of-Design Product: TECTUM Finale Wall Panel by Armstrong,  
[www.armstrongceilings.com](http://www.armstrongceilings.com)

1. Thickness: 2 inch.
2. Size: As indicated on drawings.
3. Edge Profile: Square.
4. Color: Factory PT-2/White.

B. Installation Method: Mechanically fastened per manufacturer's recommendation.

#### 2.5 ACOUSTIC WALL PANEL, AWP-2.

A. Basis-of-Design Product: TECTUM Finale Wall Panel by Armstrong,  
[www.armstrongceilings.com](http://www.armstrongceilings.com)

1. Thickness: 2 inch.
2. Size: As indicated on drawings.
3. Edge Profile: Square.
4. Color: PT-3.

B. Installation Method: Mechanically fastened per manufacturer's recommendation.

#### 2.6 FABRIC WRAPPED SEAT CUSHION, FWP-2.

A. Basis-of-Design Product: Cushions HR-40 foam with two layers of Dacron for added softness, upholstered.

1. Thickness: 2 inches.
2. Size: As indicated on drawings.
3. Edge Profile: Square.
4. Fabric Facing: Authentec Performance by Architex,
  - a. Pattern: Chambray.
  - b. Color: Scorpion.
  - c. Flame Resistance: UFAC Class 1.

#### 2.7 ACCESSORIES

A. Accessory Components: For each system indicated, provide all accessory, ancillary and other components necessary for complete installation on Project substrates in configuration indicated as work in this Section without limitation at no additional cost to the project.

B. Shims: Plastic.

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## 2.8 FABRIC WRAPPED WALL PANEL AND SEAT CUSHION FABRICATION

- A. Fabricate panels to sizes and configurations indicated.
- B. Upholstery: Fabricate fabric-covered cushions with padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.
- C. Apply padding to plywood with not less than three Velcro strips running longitudinally continuously across length of pad within 1 inch of each end.
- D. Upholster with a single piece of fabric to the greatest extent possible. Conceal all terminations out of normal view or under trim. Reinforce seams.
- E. Upholstered seating. Fabricate as follows:
  - 1. Two-Part Upholstered Back: Padded cushion glued to a plywood and covered with easily replaceable fabric.
  - 2. Preparations for Finishing:
    - a. Comply with AWI Quality Standards, filling countersunk fasteners, back priming for work.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Layout: Measure each area and establish the layout of panels to balance border widths at opposite edges of each wall/ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout indicated on reflected ceiling plans and/or interior elevations in accordance with manufacturer's approved Shop Drawings.

### 3.3 INSTALLATION

- A. General: Install to comply with manufacturer's written instructions.

### 3.4 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.
- B. Variation of Joint Width: not more than 1/32-inch variation from hairline/reveal line in 48 inches, noncumulative.

### 3.5 CLEANING AND PROTECTION

- A. Clean panels upon completion of installation to remove dust or foreign materials using a dry brush, a vacuum, or both.
- B. Maintain conditions in a manner acceptable to the Manufacturer and Installer that ensures that the fabric covered acoustical panels are without damage or deterioration at the time of substantial completion.
- C. Replace panels that cannot be cleaned and repaired, in a manner acceptable to the Architect, prior to the time of substantial completion.

END OF SECTION

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**SECTION 09 91 00 - PAINTING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

A. Section Includes:

1. Surface preparation and field painting of exposed items and surfaces on the following substrates:
  - a. Interior Substrates:
    - 1) Gypsum board.
    - 2) Hollow-metal work.
    - 3) Steel.
    - 4) Existing racquetball court walls and ceilings.
  - b. Finish and color schedules for painted surfaces (PT-#).

- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:
  - a. Architectural woodwork.
  - b. Acoustical wall panels.
  - c. Finished mechanical and electrical equipment.
  - d. Light fixtures.
2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
  - a. Foundation spaces.
  - b. Furred areas.
  - c. Ceiling plenums.
  - d. Utility tunnels.
  - e. Pipe spaces.
  - f. Duct shafts.
3. Finished metal surfaces include the following:



- a. Anodized aluminum.
  - b. Stainless steel.
  - c. Chromium plate.
  - d. Copper and copper alloys.
  - e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
    - a. Valve and damper operators.
    - b. Linkages.
    - c. Sensing devices.
    - d. Motor and fan shafts.
  5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.

### 1.3 DEFINITIONS

- A. Volatile Organic Compounds (VOCs): Compounds as defined by the U.S. Environmental Protection Agency (EPA) in 40 CFR § 51.100 (s), (1).
- B. Anti-Corrosive Paints: Coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.

### 1.4 SEQUENCING AND SCHEDULING

- A. Perform maintenance repainting in the following sequence, which includes work specified in this and other Sections:
  1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
  2. Verify that temporary protections have been installed.
  3. Examine condition of surfaces to be painted.
  4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
  5. Apply paint system.
  6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  1. Submit Samples on rigid backing, 8 inches (200 mm) square.
- C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.6 MAINTENANCE MATERIALS SUBMITTALS

- A. Furnish extra materials, from the same product run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents
  1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

#### 1.7 QUALITY ASSURANCE

- A. All materials, preparation and painting Work shall comply with the requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI).
  1. All paint manufacturers and products shall be listed under the Approved Product List section of the MPI Painting Manual.
- B. Color Matching: Custom computer-match paint colors to colors scheduled.

#### 1.8 FIELD CONDITIONS

- A. Interior:
  1. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
  2. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than (3 deg C) above the dew point; or to damp or wet surfaces.

### PART 2 - PRODUCTS

#### 2.1 PRODUCTS

- A. All interior paint systems shall be institutional, low-odor, low- or zero-VOC.
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include:
  1. Sherwin-Williams: Duration, SuperPaint or Emerald Series.
  2. Miller Paint: Evolution and Premium series.
  3. Benjamin Moore: Aura, Advance and Natura series.
  4. Rust-Oleum.

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## 2.2 PAINT MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards, including gloss levels, and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
1. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- D. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions.
1. The following chemicals shall not be used as an ingredient in any of the paints or coatings applied indoors and on-site:
    - a. Aromatic Compounds: The product must contain no more than 1.0% by weight of the sum total of aromatic compounds.
    - b. Halomethanes: Methylene Chloride.
    - c. Chlorinated Ethanes: 1,1,1-trichloroethane.
    - d. Aromatic Solvents: Benzene, Toluene (methylbenzene), Ethylbenzene.
    - e. Chlorinated Ethylenes: Vinyl Chloride.
    - f. Polynuclear Aromatics: Naphthalene.
    - g. Chlorobenzenes: 1,2-dichlorobenzene.
    - h. Phthalate Esters: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate.
    - i. Miscellaneous Semi-Volatile Organics: Isophorone. Metals and their compounds: Antimony, Cadmium, Hexavalent Chromium, Lead, Mercury.
    - j. Preservatives (Anti-Fouling Agents): Formaldehyde.
    - k. Ketones: Methyl ethyl ketone, Methyl isobutyl Ketone.
    - l. Miscellaneous Volatile Organics: Acrolein, Acrylonitrile.
  2. Volatile Organic Compounds: The volatile organic compound (VOC) concentrations (in grams per liter) of the paint or coating shall not exceed those listed below if the paint or coating is applied indoors, on-site. VOCs shall be tested in accordance with the U.S. Environmental Protection Agency (EPA) Test Method 24. The calculation of VOC shall exclude water, exempt solvents, and tinting color added at the point of sale.
    - a. Flat Interior Coatings: 50 g/L.
    - b. Non-Flat Interior Coatings: 150 g/L.
    - c. Gloss Anti-Corrosive Interior Coatings: 250 g/L.
    - d. Semi-Gloss Anti-Corrosive Interior Coatings: 250 g/L.
    - e. Flat Anti-Corrosive Interior Coatings: 250 g/L.
    - f. Floor Coatings: 250 g/L.
    - g. Flow Coatings: 420 g/L.
    - h. Pre-Treatment Wash Primers Coatings: 420 g/L.

- i. Sanding Sealers (Non-Lacquer): 350 g/L.
  - j. Specialty Primers, Sealers, and Undercoats: 350 g/L.
3. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Concrete: 12 percent.
  2. Wood: 15 percent.
  3. Gypsum Board: 12 percent.
  4. Plaster: 12 percent.
- C. Interior Substrates:
  1. Gypsum Board: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATORY CLEANING

- A. General: Use the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.

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### 3.3 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.
- B. Gypsum-Plaster and Gypsum-Board Substrates:
  - 1. Repair defects including dents and chips more than 1/16 inch in size and where directed by Architect and Owner, and all holes and cracks by filling with gypsum-plaster patching compound and sanding smooth. Remove protruding fasteners.
  - 2. Rout out surface cracks to remove loose, unsound material; fill with patching compound and sand smooth.
    - a. Finish patch to match adjacent surfaces with no visible transition. Telegraphing patching through finish coats is not acceptable.

### 3.4 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated, and with procedures specified in PDCA P4 for inspection and acceptance of surfaces to be painted.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection where present
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  - 1. SSPC-SP 3.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Wood Substrate, Shop-Primed:
  - 1. Remove stains and other materials that would impede installation of coats over primer specified.
  - 2. Reprime damaged primer.

- H. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood immediately upon delivery.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
  - 5. Reprime over areas with fillers extending approximately 1-inch beyond filler area for overcoat adhesion.
  
- I. Plastic laminate faced particle board (racquetball court walls and ceilings).
  - 1. Clean and remove stains and other materials that would impede installation of coats of paint.
  - 2. Prime surface with laminate primer.
  - 3. Lightly sand the primed laminate surface.

### 3.5 REPAINTING, GENERAL

- A. Comply with manufacturers' written instructions for application methods unless otherwise indicated in this Section.
  
- B. Prepare surfaces to be painted according to manufacturer's written instructions for each substrate condition.
  
- C. Apply a transition coat over incompatible existing coatings.
  
- D. Blending Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.
  
- E. Maintenance Repainting Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet (1.5 m) away from painted surface.
  
- F. Execution of the Work: In repainting surfaces, disturb them as minimally as possible and as follows:
  - 1. Remove failed coatings and corrosion and repaint.
  - 2. Verify that substrate surface conditions are suitable for repainting.
  - 3. Allow other trades to repair items in place before repainting.
  
- G. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use gentle methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail.
  
- H. Heat Processes: Do not use torches, heat guns, or heat plates.

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### 3.6 APPLICATION

- A. Material Preparation:
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using
- B. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint both sides and edges of doors and entire exposed surface of door frames.
  4. Paint entire exposed surface of window frames and sashes, where scheduled for painting.
  5. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  6. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  7. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- C. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- E. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- F. Sand lightly between each succeeding enamel or varnish coats.
- G. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following interior work where exposed in occupied spaces visible to the public:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces, with a nonspecular black paint or color selected by Architect.

### 3.7 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1

### 3.8 INTERIOR PAINT SYTEM SCHEDULE

- A. Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  1. System: As recommended by paint manufacturer and compatible with substrate.
- B. Interior Steel Substrates: For factory primed or existing items scheduled to be repainted, including doors and frames (factory primed), access Doors, fire cabinets, and metal casework:
  1. Primer: Transition coat where required for adhesion or compatibility.
  2. Finish Coats: Two coats, alkyd enamel finish.
- C. Gypsum Board Substrates:
  1. Latex System:
    - a. Prime Coat: Latex, interior.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior.
  2. Sheen:
    - a. Walls: Satin.
    - b. Ceiling: Satin.
- D. Wood Substrates:
  1. Latex over Latex Primer System:
    - a. Prime Coat: Primer, latex, for interior wood.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior.
  2. Sheen: Semi-gloss.
- E. Plastic Laminate Substrates (Racquetball court wall and ceiling assemblies)
  1. Acrylic system:



- a. Prime Coat: Primer, acrylic, for plastic laminate.
  - b. Intermediate Coat: Acrylic, interior, matching topcoat.
  - c. Topcoat: Acrylic, interior.
2. Sheen: Satin.

### 3.9 COLOR SCHEDULE

- A. Coordinate finish colors with systems indicated in other Sections.
- B. Manufacturer below is for color only. Provide color match where different paint manufacturer is used.
- C. Where surfaces are scheduled for primer only, provide primer indicated for substrate in systems listed above.
- D. See systems for sheen.

<b>PT-#</b>	<b>Manufacturer</b>	<b>Color</b>
PT-1	Miller Paint	Evolution, Premium/Luna Moon 0017
PT-2	Miller Paint	Evolution, Premium/ Emu 0549
PT-3	Miller Paint	Evolution, Premium/ Zen Retreat 0535
PT-4	Miller Paint	Evolution, Premium/ Starfish 1047

END OF SECTION

## SECTION 10 14 00 - SIGNAGE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Room-identification signs.
  - 2. Door-identification signs.
  - 3. Interior informational signs.
  - 4. Emergency evacuation maps.
  - 5. Interior wayfinding signage.

## 1.3 SUBMITTALS

- A. Product Data.
- B. Shop Drawings.
- C. Samples for Verification.
- D. Sign Schedule.
- E. Qualification Data.
- F. Sample Warranty.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer Warranty Period of Five years.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with all OSU requirements.
  - 1. All signage shall be vandal resistant.
  - 2. Verify acceptable fabricators and vendors with OSU prior to award.

- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

## 2.2 SIGNS

- A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles.
- B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles.

## 2.3 PANEL-SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Steel Materials:
  - 1. Metallic-Coated Steel Sheet: ASTM A 653, G90 coating, either commercial or forming steel.
  - 2. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008, commercial steel, Type B, exposed electrolytic zinc-coated, ASTM A 879, Coating Designation 08Z, with steel-sheet substrate according to ASTM A 1008, commercial steel, exposed].
  - 3. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529 or ASTM A 572, 42,000-psi minimum yield strength.
- D. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- E. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- F. Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), with coating on both sides.
- G. Fiberglass Sheet: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- H. PVC Sheet: Manufacturer's standard, UV-light stable, PVC plastic.
- I. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.
- J. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- K. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

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## 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, with adhesive on both sides.
- D. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
- C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
- F. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- B. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

## 2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## 2.8 METALLIC-COATED STEEL FINISHES

- A. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

- B. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

## 2.9 STEEL FINISHES

- A. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- B. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

## 2.10 STAINLESS-STEEL FINISHES

- A. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Directional Satin Finish: No. 4.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.

END OF SECTION

## SECTION 102600 - WALL AND DOOR PROTECTION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Impact-resistant wall coverings, (MP-1).

## 1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
  - 1. Impact-Resistant Wall Covering: 6 by 6 inches (150 by 150 mm) square.
- D. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
  - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.
- E. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep sheet material out of direct sunlight.
3. Store wall protection components for a minimum of 72 hours, or until material attains a minimum room temperature of 70 deg F (21 deg C).
  - a. Store wall covers in a horizontal position.

## 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Deterioration of plastic and other materials beyond normal use.
  2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- C. Adhesive: As recommended by impact-resistant wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### 2.2 IMPACT-RESISTANT WALL COVERINGS

- A. Impact-Resistant Sheet Wall Covering, (MP-1):

1. Manufacturers: Rigid Tex by Rigidized Metals.
2. Basis-of-Design Product: RGIDTex.
3. Size: As indicated on drawings.
4. Sheet Thickness: 0.018"-0.036"
5. Pattern: 2WL.
6. Color: Stainless Steel.
7. Height: As indicated on drawings.
8. Trim and Joint Moldings: None.
9. Mounting: Adhesive.

## 2.3 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

## 2.4 METAL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  1. Remove tool and die marks and stretch lines, or blend into finish.
  2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
  3. Run grain of directional finishes with long dimension of each piece.
  4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.



1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
2. Tightly abut edges of panels together. Do not install trim, splices or other accessories.
3. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

### 3.4 CLEANING

A. Immediately after completion of installation, clean wall protection per manufacturers' recommendation.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

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**SECTION 12 24 13 - ROLLER WINDOW SHADES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Manually operated roller shades with single rollers (RS-1).
  - 2. Motor-operated roller shades with single rollers (RS-2).
- B. Related Requirements:
  - 1. Section 05 40 00 "Cold-Formed Metal Framing" for coordinating blocking.
  - 2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
  - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Samples for Verification:
  - 1. Shadeband Material: Not less than 3 inches (76 mm) square. Mark inside face of material if applicable.
- D. Roller-Shade Schedule: Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.
- F. Product Certificates: For each type of shadeband material.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

#### 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.

#### 2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS (RS-1)

- A. Basis-of-Design Product: Mecho/5 SlimLine without Fascia manual shade by MechoShade Systems; mechoshade.com
- B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
  - 1. Bead Chains: Stainless steel.
    - a. Loop Length: Full length of roller shade.
    - b. Limit Stops: Provide upper and lower ball stops.

- c. Chain-Retainer Type: Chain tensioner, jamb mounted.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
  - 1. Roller Drive-End Location: Right side of inside face of shade.
  - 2. Direction of Shadeband Roll: Regular, from back of roller.
  - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- E. Shadebands:
  - 1. Shadeband Material: Light-blocking fabric.
    - a. Style: Classic Blackout
    - b. Color: Black/White 0731
  - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.
    - b. Color and Finish: As selected by Architect from manufacturer's full range.

### 2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES (RS-2)

- A. Basis-of-Design Product: WhisperShade DC with Electro/2 DC Bracket System Housing by MechoShade Systems.
- B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
  - 1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
    - a. Electrical Characteristics: 110-V ac or 120-V ac. Verify prior to procurement.
    - b. Maximum Total Shade Width: As required to operate roller shades indicated.
    - c. Maximum Shade Drop: As required to operate roller shades indicated.

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3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for surface mounting. Provide the following for remote-control activation of shades:
    - a. Individual Switch Control Station: Maintained-contact, wall-switch-operated control station with open, close, and center off functions.
      - 1) Switch Positions: As selected by Architect.
      - 2) Switch Style: As selected by Architect.
    - b. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.
    - c. Color: As selected by Architect from manufacturer's full range.
  
  - C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
    1. Roller Drive-End Location: Right side of inside face of shade.
    2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
    3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
  
  - D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
  
  - E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.
  
  - F. Shadebands:
    1. Shadeband Material: Light-blocking fabric.
      - a. Style: Classic Blackout
      - b. Color: Black/White 0731
    2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      - a. Type: Enclosed in sealed pocket of shadeband material.
      - b. Color and Finish: As selected by Architect from manufacturer's full range.
  
  - G. Installation Accessories:
    1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
      - a. Height: Manufacturer's standard in height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
    2. Endcap Covers: To cover exposed endcaps.
    3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
5. Installation Accessories Color and Finish: .As selected from manufacturer's full range.

## 2.4 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
  1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
  2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
  1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
  2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
  - 1. Opaque Shadebands: Located so shadeband is not closer than [2 inches (51 mm)] to interior face of glass. Allow clearances for window operation hardware.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

### 3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

### 3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 24 13

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**SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes Design-Build work.
- B. The intent of Division 21, Fire Suppression Specifications, and the accompanying Drawings is to be a reference for preliminary locations and routing of fire protection system components. Not all components required for a complete system are shown, including but not limited to standpipes, hose connections, sprinkler heads, fire protection zones, air compressors, dry valves, piping, appurtenances, connections, etc.
- C. Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, fire marshal, owner's insurance underwriter, and any other authority having jurisdiction.
- D. Division 21, Fire Suppression Specifications and the accompanying Drawings are complimentary and what is called for by one as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa.
- E. Imperative language is frequently used in Division 21, Fire Suppression Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
- F. Piping and sprinkler head locations meet the Architectural design intent for the building in addition to applicable code. The right is reserved to make any reasonable changes in sprinkler head location prior to roughing-in, without cost impact. Deviation from the general routing piping mains, standpipes, or other routing shown must be approved by the architect prior to installation. If additional space is required for fire protection system components, Architect to make a formal request.
- G. Heat, heat trace, and associated power required for fire protection system components are the responsibility of the design-build contractor. Request approval from the electrical engineer to use spaces in electrical panels provided at no additional cost.
- H. Furnish piping, pipe fittings, valves, gauges, and incidental related items as required for complete systems. Identify valves, piping and equipment components to indicate their function and system served.
- I. The General and Supplemental Conditions apply to this Division, including but not limited to:
  - 1. Drawings and specifications.
  - 2. Public ordinances, permits.
  - 3. Include payments and fees required by governing authorities for work of this Division.
- J. Division 01, General Requirements, applies to this Division.

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 21, Fire Suppression



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C. Section 21 10 00, Water Based Fire Suppression Systems

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment's within this specification contain these banned substances, provide complying products and equipment's from approved manufacturers with equal performance characteristics.
2. General:
  - a. Conform Work and materials to requirements of the local and State codes, fire marshal, the owner's insurance underwriter, and any other authority having jurisdiction; and Federal, State and other applicable laws and regulations.
3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
4. Fire protection system designs must bear the stamp and seal of the registered Professional Engineer who prepared the documents. The Engineer's stamp certifies that the work was done under the Engineer's supervision and control. Certification from NICET technicians, or other contractors, cannot replace the certification by the Engineer. Verify/coordinate with local building department for their specific requirements.

B. New materials and Equipment:

1. Good work quality, free of faults and defects and in conformance with the Contract Documents.

C. Apparatus: Build and install to deliver full rated capacity at the efficiency for which it was designed.

D. The entire system and apparatus operate at full capacity without objectionable noise or vibration.

E. For remodel projects, the existing system must remain fully operational, or provisions made to provide coverage while the new system is being installed. New installation switchover requires minimal down time. Provide method to maintain fire protection or fire watch during any system down time. Include any related cost for materials or labor that is needed for providing continuous coverage.

F. Install equipment level and true equipment. Housekeeping pads and curbs account for floor or roof slope.

G. Materials and Equipment:

1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.

2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.

H. Workmanship:

1. General: Install materials in a neat and professional manner.
2. Manufacturer's Instructions:
  - a. Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 21, Fire Suppression Specifications, obtain clarification before starting work.

I. Cutting and Patching:

1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams or columns without permission of Architect and then only as directed.
5. New or existing work cut or damaged restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces repaired, refinished, and left in condition existing prior to commencement of work.

#### 1.4 SUBMITTALS

A. Certified Shop Drawings:

1. Drawings indicate the general layout of the piping and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare fire protection system layout Drawings showing locations and types of head or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. New drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to the Drawings and identifying Architect's Drawing number or any reference drawings.

Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.

2. Shop Drawings:
  - a. Prepare in two-dimensional format.
  - b. Include but are not limited to:
    - 1) Sprinkler head layout drawings overlaid with ceiling and floor plans.
    - 2) Sprinkler floor plans, including piping, equipment, and heads to a minimum of 1/4-inch equals 1-foot scale or same as plans, whichever is greater.
    - 3) Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
    - 4) Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
    - 5) Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
3. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:

1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable
2. Provide sample of each type of sprinkler head.
3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Test Reports:

1. Submit certificates of completion of tests and inspections.

D. Submission Requirements:

1. Refer to Division 01, General Requirements for additional requirements related to submittals.
2. Shop Drawings:
  - a. Provide three sets of Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the Architect for review prior to submitting Drawings to insurance underwriter and Fire Marshal.

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- b. Provide six sets of Drawings and calculations to the Architect to be sent to the Owner's insurance underwriter for approval.
  - c. Then submit six sets of approved Drawings to Architect for final review.
3. Product Data:
    - a. Submit electronic copies of shop drawings and product data for Work of Division 21 in PDF format with each item filed under a folder and labeled with its respective specification section number, article, paragraph, and mark, if applicable.
    - b. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
    - c. Submit shop product data in a single submittal. Partial submittals will not be accepted. Re-submittals submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned re-submittals, insert them in the previously submitted binder.
- E. Contractor Responsibilities:
1. See that submittals are submitted at one time and are in proper order.
  2. Obtain approvals and permits from the AHJ.
  3. Ensure that equipment will fit in the space provided.
  4. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.
- 1.5 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS
- A. Refer to Division 01, General Requirements for additional requirements.
  - B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.
  - C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.
- 1.6 AS-BUILT DRAWINGS
- A. Provide record drawings in hard copy and PDF format.
    1. Drawings include the following:
      - a. Project specific title block.
      - b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

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### 1.7 PROJECT CONDITIONS

- A. Existing Conditions: Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work. Include related costs in the initial bid proposal.
- B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
- C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

### 1.8 WARRANTY

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

### 1.9 TEST REPORTS AND CERTIFICATES

- A. Submit one copy of test reports and certificates specified herein to the Architect.

### 1.10 SUBSTITUTIONS

- A. Submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

## PART 2 - PRODUCTS

### 2.1 ACCESS PANELS

- A. Furnish under this Division as specified in another Division of work.

### 2.2 PIPE SLEEVES

- A. Interior Wall and Floor Sleeves:
  - 1. 18 gauge galvanized steel or another pre-approved water tight system.
- B. Interior Wall and Floor Sleeves (fire rated):
  - 1. Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

## PART 3 - EXECUTION

### 3.1 COORDINATION

- A. Coordinate fire protection piping and appurtenances with ducts, other piping, electrical conduit, and other equipment.

- B. Conceal fire protection piping and equipment be concealed except in area without ceilings and as noted on the Drawings.
- C. Locate piping, heads, and equipment where shown on Drawings.

### 3.2 GENERAL

- A. Install fire protection systems to serve the entire building.
- B. The Drawings indicate general location of sprinkler heads in ceiling areas, approximate locations of piping, sprinkler zones, and types of systems. Deviations must be approved.
- C. The drawings do not indicate the locations of sprinkler heads in ceiling areas. Locate sprinklers in the center of ceiling panels and symmetrically within rooms, coordinated with and in pattern with lights and grilles. Deviations must be approved.
- D. Locations of sprinkler heads, outlets, piping, and appurtenances are not shown in areas and therefore are to be installed in accord with code requirements.

### 3.3 SLEEVES

- A. Interior Floor and Wall Sleeves:
  - 1. Provide sleeves large enough to provide clearances around pipe outside diameter as required by NFPA. Penetrations through mechanical room and fan room floors made watertight by packing with safin insulation and sealing with Tremco Dymeric Sealant or approved water tight system.
- B. Sleeves through Rated Floors and Walls:
  - 1. Similar to interior sleeves except install fire-rated system approved by Authority Having Jurisdiction and Owner's Insurance Underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
- D. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.

### 3.4 CLEANING

- A. General:
  - 1. Clean equipment and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
- B. Painted Surfaces:
  - 1. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- C. Additional requirements are specified under specific Sections of this Division.

### 3.5 EQUIPMENT PROTECTION

- A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated equipment, or apparatus to original conditions or replace at no cost to the Owner.
- B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
- C. Cover or otherwise suitably protect equipment and materials stored on the job site.

### 3.6 ACCESSIBILITY

- A. General:
  - 1. Locate valves, indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Gauges:
  - 1. Install gauges so as to be easily read from the floors, platforms, and walkways.

### 3.7 PAINTING

- A. General:
  - 1. Coordinate painting of fire suppression equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
- B. Equipment Rooms and Finished Areas:
  - 1. Hangers
  - 2. Miscellaneous Iron Work
  - 3. Structural Steel Stands
  - 4. Tanks
  - 5. Steel Valve Bodies and Bonnets:
    - a. One coat of black enamel.
  - 6. Sprinkler Heads:
    - a. Not painted.
- C. Sprinkler Piping:
  - 1. Exposed to View: Paint pipe and hangers exposed to view, including in equipment spaces, with one coat approved rust inhibiting primer. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.

### 3.8 ADJUSTING AND CLEANING

#### A. General:

1. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
2. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

#### B. Piping:

1. Clean interior of piping before installation.
2. Flush sediment out of piping systems.

END OF SECTION



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**SECTION 21 10 00 - WATER BASED FIRE SUPPRESSION SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes Design-Build work and the following:
  - 1. Sprinkler Heads
  - 2. Valves
  - 3. Black Steel Pipe
  - 4. Mechanical Pipe Couplings and Fittings
  - 5. Valve Identification
  - 6. Piping Markers
  - 7. Equipment Identification

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 21, Fire Suppression

**1.3 QUALITY ASSURANCE**

- A. Provide a complete automatic fire sprinkler/combination standpipe system.
  - 1. Grooved joint couplings, fittings, valves, and specialties products of a single manufacturer. Grooving tools of the same manufacturer as the grooved components.
  - 2. Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.
- B. Regulatory Requirements:
  - 1. Sprinkler system to comply with NFPA 13 and local Fire Marshal requirements.
  - 2. Refer to Section 21 05 00, Common Work Results for Fire Suppression for additional requirements.
  - 3. Comply with Factory Mutual requirements for Hazard Class and System Design.
- C. Hydraulically Calculated Sprinkler System: Sprinkler system to be hydraulically calculated grid system designed to provide:
  - 1. Light Hazard Occupancies: 0.10 GPM/Ft<sup>2</sup> density at most remote 1500 SF for public areas, living spaces, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.
  - 2. Ordinary Hazard Occupancies Group 1: 0.15 GPM/Ft<sup>2</sup> density at most remote 1500 SF for mechanical rooms, kitchen, and parking areas, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.

3. Ordinary Hazard Occupancies Group 2: 0.20 GPM/Ft<sup>2</sup> density at most remote 1500 SF for mechanical rooms, kitchen, and parking areas, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.
- D. NFPA 13 (without the use of exceptions found in NFPA 13 systems minimum guideline) used for the location, sizing, and installation of piping and sprinkler systems unless local fire marshal or owner's insurance underwriter requirements are more stringent. Exceptions must be approved by the Engineer prior to usage.
- E. Water Service Pressure Basis of Design:
  1. Coordination was done to determine fire service water pressure used to develop the fire sprinkler system design information included herein.
  2. Fire Protection contractor to obtain current flow test information prior to starting their design of the fire sprinkler system.
- F. Automatic sprinklers within elevator hoistways and machine rooms complies with ANSI A17.1-102.2 (c) 4 requirements.

#### 1.4 SUBMITTALS

- A. Provide submittal in accordance with Section 21 05 00, Common Work Results for Fire Suppression.
- B. Sprinklers referred to on shop drawings and identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Sprinkler Heads:
  1. Viking
  2. Victaulic
  3. Reliable Automatic Sprinkler
  4. Tyco Fire Products
- B. Valves:
  1. Where only one manufacturer's model is listed, equivalent products by those specified below, or equal, are acceptable.
  2. Use only one manufacturer.
  3. Gate, Swing Check:
    - a. Jenkins
    - b. Victaulic
    - c. Crane
    - d. Hammond
    - e. NIBCO
    - f. Kennedy
  4. Butterfly:
    - a. Jenkins

- b. NIBCO
  - c. Keystone
  - d. Victaulic
  - e. Gustin-Bacon
5. Specialty:
- a. NIBCO
  - b. Conbraco
  - c. Victaulic
- C. Mechanical Pipe Couplings and Fittings:
- 1. Victaulic
  - 2. Gruvlok
- D. Piping Markers:
- 1. W.H. Brady
  - 2. Seton
  - 3. Marking Systems, Inc. (MSI).

## 2.2 SPRINKLER HEADS

- A. General:
- 1. One manufacturer throughout building. Mixing of sprinkler brands is not permitted.
  - 2. Brass frame construction with a coated metal-to-metal seating mechanism. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.
  - 3. Quick response frangible bulb type fusible element with a temperature rating of 155 degrees or 200 degrees F or a fast response metal type fusible element with a temperature rating of 165 degrees or 212 degrees F.
  - 4. 1/2-inch NPT, a standard orifice, and a 5.6 nominal K Factor.
  - 5. UL listed and FM Approved for working water pressures up to 175 psi. Sprinkler heads in dry and pre-action type systems installed per NFPA 13.
  - 6. Heads, UL approved for application and installation.
- B. Sprinklers Installed in Finished Ceilings:
- 1. Quick response, recessed, bulb type, chrome finish, 165 degrees F unless required otherwise.
- C. Sprinklers Installed in Unfinished Ceiling Areas (or Above Finished Ceilings Where Required):
- 1. Pendant or up-right fusible solder type, rough bronze finish, and adequate temperature for the hazard.
- D. Flexible Stainless Steel Hose:
- 1. UL rated, FM approved stainless steel hose assembly for individual sprinkler connections, Victaulic Vic-Flex.

2. Drop includes a UL approved braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces.
3. Provide union joints for ease of installation.
4. Attach flexible drop to the ceiling grid using a one-piece open gate bracket. The bracket allows installation before the ceiling tile is in place.
5. The braided drop system is UL listed and FM Approved for sprinkler services to 175 psi (1206 kPa).

### 2.3 VALVES

- A. Gate, butterfly, and check valves meet current MSS standards.
- B. Bronze gate and check valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- C. Full lug and grooved butterfly valves suitable for bi-directional dead end service at full rated pressure without use or need of a downstream flange.
- D. Valves in Insulated Piping: Valves have 2-inch stem extensions and the following features:
  - E. Gate Valves: Rising stem type.
  - F. Butterfly Valves: Extended necks.
  - G. Valve ends may be threaded, flanged, soldered, or grooved as applicable to piping system.
  - H. Provide ball drip drains, test orifices, and other related items as required to provide a complete fire protection system.
- I. Gate Valves:
  1. Bronze Gate: Bronze body, bronze screwed bonnet, bronze solid wedge, OS&Y pattern, rising stem, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO T-104.
  2. Iron Gate: Iron body, bronze trim, OS&Y pattern, solid wedge, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO F-607-OTS.
- J. Check Valves:
  1. Horizontal Bronze Swing Check:
    - a. Bronze body, bronze-mounted, TFE disc, 150 psi SWP, 300 psi CWP; NIBCO T-443-Y, NIBCO S-433-Y.
    - b. Check valves in main riser path FM approved.
  2. Horizontal Bronze Swing Check, High Pressure:
    - a. Bronze body, bronze-mounted, regrinding bronze disc, 300 psi SWP, 1000 psi CWP; NIBCO T473-B.
    - b. Check valves in main riser path FM approved.
  3. Horizontal Iron Swing Check:
    - a. Iron body, bronze-mounted, regrinding bronze disc and seat ring, 200 psi CWP; NIBCO F-918-B.

- b. Check valves in main riser path FM approved.

K. Butterfly Valves:

1. Iron Butterfly:

- a. Ductile iron body, aluminum-bronze disc and one-piece stainless steel shaft, copper bushing, fasteners and pins not used to attach stem to disc, gear operator, stem neck length to accommodate insulation where applicable, EPDM liner or disc, 200 psi CWP; NIBCO LD 2000 (lug style), NIBCO GD-4765 (grooved ends).
- b. Butterfly valves in main riser path, FM approved.

L. Specialty Valves:

- 1. Drain Valves: Bronze ball valve, garden hose end, cap and chain 3/4-inch size, bronze cast body, chrome-plated full port ball, with handle, Teflon seat, threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing, 600 psi CWP; NIBCO T-585-70-HC.

## 2.4 BLACK STEEL PIPE

A. General:

- 1. UL listed and FM approved for fire protection use.
- 2. Fittings and joints must be UL listed with pipe chosen for use.
- 3. Listing restrictions and installation procedures per NFPA 13 and state and local authorities for fire protection use.
- 4. Pipe/fittings must be hot-dipped galvanized in accordance with ASTM A53 for dry pipe sprinkler systems.

B. Pipe: ASTM A135 or A53.

1. Fire Protection:

- a. Schedule 10 or Schedule 40 in sizes up to 5 inches.
- b. 0.134-inch wall thickness for 6-inch.
- c. 0.188-inch wall thickness for 8-inch and 10-inch.
- d. 0.330-inch wall thickness for 12-inch.

C. Fittings: Roll grooved ends with mechanical couplings as specified.

D. Service Above Grade: Fire protection system only for sizes listed, as approved by NFPA 13.

## 2.5 MECHANICAL PIPE COUPLINGS AND FITTINGS

A. Couplings and Fittings:

- 1. Coupling housing to be zero flex rigid type coupling with angled bolt pad design. Couplings fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Similar to Victaulic Type 009N.

2. Flexible couplings to be used only when expansion contraction, deflection or noise and vibration is to be dampened. Flexible Coupling to be similar to Victaulic Installation-Ready Type 005. Coupling gasket similar to Victaulic's Grade E molded synthetic rubber per ASTM D-2000.
3. Coupling bolts oval neck track head type with hexagonal heavy nuts per ASTM A-449 and A-183.

2.6 VALVE IDENTIFICATION

A. Valve Tags:

1. General:

- a. Identify valves with metal tags or plastic signs, legends to be stamped or embossed.
- b. Indicate the function of the valve and its normal operating position, and area served; i.e.

3RD FL	(Area Served)
ISOLATION	(Valve Function)
NO	(Normal Operation Position)

2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
3. Material: Use 0.050 or 0.064-inch brass tags.
4. Control Valves:
  - a. Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicaid, or equal.
  - b. Form letters by exposing center ply.

B. Valve Tag Directory: Include the following:

1. Tag Number
2. Location
3. Exposed or Concealed
4. Area Served
5. Valve Size
6. Valve Manufacturer
7. Valve Model Number
8. Normal Operating Position of Valve

2.7 PIPING MARKERS

- A. Label pipes with all-vinyl, self-sticking labels or letters.
- B. Pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters.
- C. Identify and color code as follows with white directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
SPRINKLER WATER	FIRE PROTECTION WATER	RED

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## 2.8 EQUIPMENT IDENTIFICATION

- A. Nameplates:
  - 1. Tag pumps, and miscellaneous equipment with engraved nameplates.
  - 2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black.
  - 3. Form letters by exposing center ply.
  - 4. Identify unit with code number as shown on Drawings and area served.
- B. Equipment Nameplate Directory:
  - 1. List pumps, compressors and other equipment nameplates.
  - 2. Include Owner and Contractor furnished equipment.
  - 3. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:
  - 1. Provide seismic hangers as required by code.
  - 2. Provide tamper switches on sprinkler system isolation valves. Provide flow switches for sprinkler zones. See Drawings for locations.
  - 3. A corrosion-resistant metal placard provided on riser indicating location number of sprinklers, design criteria, water demand, and date of installation.
  - 4. Provide fire sprinkler guards on exposed sprinklers in areas subject to damage.
  - 5. Quick response sprinklers listed for installation in an Ordinary Hazard occupancy when installed in an Ordinary Hazard occupancy.
- B. Flexible Sprinkler Wet Head Drop:
  - 1. Install per manufacturer's installation requirements.
  - 2. Coordinate head location with other trades to assure space is available to maintain proper radius requirements.
  - 3. Provide flexible sprinkler drops of appropriate length as conditions require.
  - 4. Provide flexible sprinkler drops at sprinkler heads located in suspended, dropped, or acoustical ceilings. In hard lid ceiling areas, provide flexible heads at Contractor's option.
- C. Electrical: Electrical work to comply with Division 26, Electrical.
- D. Hangers and Supports:
  - 1. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
  - 2. Install standpipe piping, hangers, and supports in accordance with NFPA 14.

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3. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- E. Valves:
1. Provide valves at connections to equipment where shown or required for equipment isolation.
  2. Install valves accessible and same size as connected piping.
  3. Provide separate support for valves where necessary.
  4. Provide drain valves in low points in the piping system, and at equipment, as required by code, and as indicated.
  5. Fire Suppression Service:
    - a. In piping 2-inches and smaller; bronze gate valve, bronze swing check valve, vertical check valve.
    - b. In piping 2-1/2-inches and larger; iron gate valve, iron swing check valve, vertical check valve.
    - c. UL approved butterfly valves.
- F. Piping Preparation:
1. Measurements, Lines and Levels:
    - a. Check dimension at the building site and establish lines and levels for work specified in this Section.
    - b. Establish inverts, slopes, and elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
    - c. Use established grid and area lines for locating trenches in relation to building and boundaries.
- G. Piping:
1. Hold piping as tight to structure as possible. In general, run piping in areas without ceilings parallel to building elements in a neat, professional manner.
  2. Pipe inspector test connections to exterior and discharge as approved by local applicable governing authorities.
  3. Provide test tees as required.
  4. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
  5. Mechanical Couplings:
    - a. On systems using galvanized pipe and fittings, galvanize fittings at factory.
    - b. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
    - c. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
  6. Install piping as to drain per NFPA 13.
  7. Support piping independently at apparatus so that its weight not carried by the equipment.



## H. Drain Piping:

1. Pitch drain piping 1/2-inch per 10-feet minimum; no traps allowed.
2. Discharge drain piping to outside with suitable splash plate to a location as approved by the architect.

## I. Piping Joints:

1. Join pipe and fittings using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.

2. No couplings installed in floor or wall sleeves.

## 3. Steel Piping:

## a. Screwed Joints:

- 1) Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
- 2) Joints made up with suitable lubricant or Teflon tape applied to male threads only, leaving two threads bare.
- 3) Joints tightened so that not more than two threads are left showing.
- 4) Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.

## 4. Welded Joints:

## a. Preparation for Welding: Bevel piping on both ends before welding:

- 1) Use following weld spacing on butt welds:

NOMINAL PIPE WALL THICKNESS	SPACING	BEVEL
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

- 2) Before welding, remove corrosion products and foreign material from surfaces.

## b. Welded Joints:

- 1) Use arc-welding process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for turns, use welding tees for tees. Use reducing fittings for size reduction. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.

## c. Welding Operation:

- 1) After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
- 2) Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.

- 3) Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.

### 3.2 IDENTIFICATION

#### A. Valve Identification:

1. Valve Tags:
  - a. Attach to valve with a brass chain.
  - b. Valve tag numbers continuous throughout the building for each system. Obtain a list for each system involved from the owner.
2. Valve Tag Directory:
  - a. Post final copy in Operation and Maintenance Manual.

#### B. Piping Markers:

1. Unless recommendations of ANSI A13.1, 1981 are more stringent, apply labels or letters after completion of pipe cleaning, painting, or other similar work, as follows:
  - a. Every 20-feet along continuous exposed lines.
  - b. Every 10-feet along continuous concealed lines.
  - c. Adjacent to each valve and stub out for future.
  - d. Where pipe passes through a wall, into and out of concealed spaces.
  - e. On each riser.
  - f. On each leg of a T.
  - g. Locate conspicuously where visible.
2. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

### 3.3 EXTRA STOCK

- A. Provide additional number of heads of each type and temperature rating installed as required to meet NFPA 13 requirements.
- B. Provide storage cabinet or cabinets as required to receive reserve sprinkler heads and special installation tools required.
- C. Provide index label for each head indicating manufacturer, model, orifice size of K-factor, and temperature rating.
- D. Provide, inside cabinet a list of heads stored within and brief description of where installed.
- E. Locate cabinet near sprinkler control station as approved.

### 3.4 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Perform tests and arrange for required inspections of installed system as required.
2. Notify the Architect 48 hours prior to any test or inspection.

3. Provide final test and certification in the presence of an Owner representative. Coordinate hereunder.
- B. Inspection Service:
1. At start of warranty year, execute inspection agreement.
  2. Without additional charge to Owner, make quarterly inspection of system during year.
    - a. Check and operate control valves.
    - b. Lubricate valve parts.
- C. Report each inspection to Owner.

END OF SECTION

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**SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC****1.1 SUMMARY**

- A. The intent of Division 23, HVAC Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include work specified in Division 23, HVAC and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.
- B. The Drawings that accompany the Division 23, HVAC Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in outlet location prior to roughing-in, without cost impact.
- C. The General and Supplemental Conditions apply to this Division, including but not limited to:
  - 1. Drawings and specifications.
  - 2. Public ordinances, permits.
  - 3. Include payments and fees required by governing authorities for work of this Division.
- D. Division 01, General Requirements, General Requirements, applies to this Division.

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

**1.3 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Products and equipment prohibited from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
  - 2. General: Work and materials conforms to the local and State codes, and Federal, State and other applicable laws and regulations.
  - 3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
- B. New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.

- 
- C. Apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.
  - D. The entire mechanical system and apparatus operates at full capacity without objectionable noise or vibration.
  - E. Install equipment level and true. Housekeeping pads and curbs account for floor or roof slope.
  - F. Materials and Equipment:
    - 1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
    - 2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
    - 3. Furnish materials and equipment of size, make, type, and quality herein specified.
    - 4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.
  - G. Workmanship:
    - 1. General: Install materials in a neat and professional manner.
    - 2. Manufacturer's Instructions:
      - a. Follow manufacturer's directions where they cover points not specifically indicated.
      - b. If conflict with the Drawings and Division 23, HVAC Specifications, obtain clarification before starting work.
  - H. Cutting and Patching:
    - 1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
    - 2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
    - 3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
    - 4. Do not pierce beams or columns without permission of Architect and then only as directed.
    - 5. Restore new or existing work cut or damaged to its original condition. Where alterations disturb lawns, paving, walks, etc., surfaces repaired, refinished, and left in condition existing prior to commencement of work.

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## 1.4 SUBMITTALS

### A. Shop Drawings:

1. The Contract Drawings indicate the general layout of the piping, ductwork, and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of piping, ductwork, and equipment installations. Shop Drawings new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings. Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Prepare in two-dimensional format.
3. Include but are not limited to:
  - a. Complete floor plans with sheet metal and HVAC piping to a minimum of 1/4-inch equals 1-foot scale.
4. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

### B. Product Data:

1. In general, submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
2. List the name of the motor manufacturer and service factor for each piece of equipment.
3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

### C. Submission Requirements:

1. Shop Drawings and Product Data:
  - a. Refer to Division 01, General Requirements for additional requirements related to submittals.
  - b. Submit electronic copies of shop drawings and product data for Work of Division 23, HVAC in PDF format with each item filed under a folder and labeled with its respective specification section number, Article and paragraph and mark if applicable.
  - c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.

- d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities:

1. Submit submittals one time and are in proper order.
2. Ensure that equipment will fit in the space provided.
3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

### 1.5 AS-BUILT DRAWINGS

A. Record Drawings: Provide hard copies and pdf format.

1. Drawings include the following:
  - a. Project Specific Titleblock.
  - b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

### 1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

- A. Refer to Division 01, General Requirements for additional requirements.
- B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.
- C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.

### 1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.
2. Include related costs in the initial bid proposal.

- B. Coordinate exact requirements governed by actual job conditions. Check information and report discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

- C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, the City, and Utility Company.

## 1.8 WARRANTY

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

## 1.9 TEST REPORTS AND CERTIFICATES

- A. Submit one copy of test reports and certificates specified herein to the Architect.

## 1.10 SUBSTITUTIONS

- A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

## PART 2 - PRODUCTS

### 2.1 FLOOR, WALL AND CEILING PLATES

- A. Furnish stamped split type plates as follows:
  - 1. Floor Plates: Cast brass, chromium plated.
  - 2. Wall and Ceiling Plates: Spun aluminum.

### 2.2 MACHINERY GUARDS

- A. Furnish guards for protection on rotating and moving parts of equipment. Provide guards for metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.
- B. Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.
- C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards easily removable for pulley adjustment or removal and changing of belts.
- D. Guards meet OSHA requirements including back plates.
- E. Provide inlet and outlet screens on fans in plenums or where exposed to personnel.

### 2.3 ELECTRICAL EQUIPMENT

- A. General: Equipment and installed work as specified under Division 26, Electrical.
- B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available fault current rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment with a Short Circuit Current Rating (SCCR) that meets the bracing requirement.
- C. Motors – AC Induction:
  - 1. Furnish as integral part of driven equipment.



2. Drip proof induction type with ball bearings unless noted otherwise.
3. Motors 1 hp and above premium energy efficient type, except for emergency equipment motors.
4. Built to NEMA Standards for the service intended.
5. Rated for voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
6. Energy Efficient Motors:
  - a. Baldor
  - b. Westinghouse
  - c. General Electric
  - d. Or approved equal.
7. Motors meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.

MINIMUM MOTOR EFFICIENCIES					
		RPM IEEE 112B Efficiency			
HP	KW	900	1200	1800	3600
1	0.75	--	82.5	85.5	80.0
1.5	1.15	--	86.5	86.5	85.5
2	1.53	--	87.5	86.5	86.5
3	2.3	84.0	89.5	89.5	88.5
5	3.8	85.5	89.5	89.5	89.5

8. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
  9. Refer to individual product sections for additional motor requirements.
  10. Furnish motors on belt drive equipment of nominal nameplate horsepower not less than 120 percent of equipment brake horsepower required for performance specified.
  11. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
  12. Motors controlled by variable frequency drives inverter duty rated and have Class F insulation or better. Withstand repeated voltage peaks of 1600V with rise times of 0.1 microseconds and greater in accordance with NEMA Standard MG1 Part 31.
  13. Motors served from variable frequency drives equipped with shaft grounding system which provide a path for current to flow between the shaft and motor frame. SGS or equal.
- D. Motors – Electronic Commutation (EC):
1. Furnished as integral part of driven equipment.
  2. Permanently lubricated with ball bearings unless noted otherwise.
  3. Internal motor circuitry converts AC power supplied to the motor to DC power to operate the motor.

4. Speed controllable down to 20 percent of full speed.
  5. Motor efficiency at a minimum of 85 percent at all speeds.
  6. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
  7. Refer to individual product sections for additional motor requirements.
  8. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Quick trip devices hermetically sealed motors.
- E. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.
- F. Equipment Wiring:
1. Interconnecting wiring within or on a piece of mechanical equipment provided with the equipment unless shown otherwise.
  2. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.
- G. Control Wiring: Control wiring for mechanical equipment provided under Section 23 09 00, Instrumentation and Controls for HVAC.
- H. Codes: Electrical equipment and products bear the UL label as required by governing codes and ordinances.

## PART 3 - EXECUTION

### 3.1 CLEANING

- A. General: Clean mechanical equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.
- B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- C. Additional requirements are specified under specific Sections of this Division.

### 3.2 EQUIPMENT PROTECTION

- A. Keep pipe, ductwork, and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.
- B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
- C. Cover or otherwise suitably protect equipment and materials stored on the job site.

### 3.3 ACCESSIBILITY

- A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

### 3.4 PAINTING

- A. General:
  - 1. Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
  - 2. Exposed work under this Division receives either a factory painted finish or a field prime coat finish, except:
    - a. Exposed copper piping.
    - b. Aluminum jacketed outdoor insulated piping.
- B. Equipment Rooms and Finished Areas:
  - 1. Insulation: Not painted.
  - 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
  - 3. Steel Valve Bodies and Bonnets: One coat of black enamel.
  - 4. Brass Valve Bodies: Not painted.
  - 5. Equipment:
    - a. One coat of grey machinery enamel.
    - b. Do not paint nameplates.
  - 6. Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers, and registers flat black.

### 3.5 ADJUSTING AND CLEANING

- A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
- B. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

### 3.6 ELECTRICAL EQUIPMENT

- A. Ductwork or piping for mechanical systems not serving electrical space not installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.
- B. Ductwork or piping for mechanical systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

### 3.7 EQUIPMENT CONNECTIONS

- A. Make final connections to equipment specified in sections other than Division 23, HVAC of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.
- B. Ductwork: Make exhaust connections to fume hoods, emergency generator radiators, and any other processing, laboratory, or kitchen equipment in strict accordance with manufacturer's instructions.

END OF SECTION

## SECTION 23 05 29 - HANGERS, SUPPORTS, AND ANCHORS FOR HVAC

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

## 1.2 SUMMARY

- A. This Section includes Design-Build work.
- B. This Section includes:
  - 1. Supports
  - 2. Building Attachments

## 1.3 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)
- C. Section 23 07 00, Insulation for HVAC

## 1.4 QUALITY ASSURANCE

- A. Provide equipment hangers and supports in accordance with the following:
  - 1. Design supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for conduit, piping, and ductwork when not shown on the Drawings.
  - 2. Hangers, supports and sway braces to be fabricated in accordance with ANSI B31.1 and MSS SP-58 and SP-89.
  - 3. Use components for intended design purpose only. Do not use for rigging or erection purposes.
  - 4. Seismic restraints and anchorages shall resist seismic forces as specified in the state and local code or by the authority having jurisdiction for the seismic zone in which the project is constructed.
  - 5. Connections to structural framing are not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
  - 6. Seismic Restraints:
    - a. Shall not introduce stresses in the piping caused by thermal expansion or contraction to exceed forces or design limits of the piping per ASME B31.9.

- b. Provided in accordance with the latest edition of the SMACNA, Seismic Restraint Manual Guidelines for Mechanical Systems” for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
  - c. Provided in accordance with the local applicable codes.
  - d. Follow provisions described in Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.
- B. Engineered Support Systems: Provide design services for the following support systems:
1. Supports and seismic restraints for suspended piping, ductwork, and equipment.
  2. Support frames such as pipe racks or stanchions for piping, ductwork, and equipment which provide support from below.
  3. Equipment, ductwork, and piping support frame anchorage to supporting slab or structure.

## 1.5 SUBMITTALS

- A. Submit the following:
1. Shop Drawings of contractor fabricated support structures.
  2. Structural Details and Calculations:
    - a. Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.
    - b. Details and calculations shall bear the seal of a professional engineer registered in the state having jurisdiction.
  3. No other submittals required under this section.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Supports:
1. Unistrut
  2. Superstrut
  3. Powerstrut
  4. Kinline
  5. B-Line Systems
  6. AnvilStrut
- B. Building Attachments
1. Anvil
  2. Elcen
  3. Superstrut

4. B-Line Systems
5. Tolco
6. ERICO

## 2.2 SUPPORTS

- A. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.
- B. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.
- C. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.
- D. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

## 2.3 BUILDING ATTACHMENTS

- A. Beam Hangers:
  1. On piping 6-inch and smaller: Anvil 86 with retaining clip Fig. 89.
  2. On piping larger than 6-inch: Anvil 228, or 292.
- B. Inserts: Anvil 152 malleable iron or 281 steel inserts. Inserts sized for required rod to support load being carried.
- C. Expansion Plugs: Similar and equal to Phillips "red-head" self-drilling flush shell selected for safety factor of 4.
- D. Powder actuated fasteners with silencers as approved by Architect.

## PART 3 - EXECUTION

### 3.1 HANGERS AND SUPPORTS

- A. General:
  1. Install support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required, and as detailed on the Drawings.
  2. Provide adjustable hangers for pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
  3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
  4. Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and style as installed for adjacent similar piping.
  5. Support piping within 2-feet of each change of direction on both sides of fitting.

**B. Building Attachments:**

1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
2. Provide horizontal bracing on horizontal runs 1-1/2-inch and larger and exceeding 50-feet in length at 75-foot intervals and as required to provide stabilized piping systems.
3. Provide additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

END OF SECTION



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**SECTION 23 05 93 - TESTING, ADJUSTINNG, AND BALANCING FOR HVAC****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes:
  - 1. Testing and Balancing of Air Systems

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

**1.3 QUALITY ASSURANCE**

- A. Acceptable Testing and Balancing Firms:
  - 1. A.I.R., Inc.
  - 2. Air Balance Specialty, Inc.
  - 3. Neudorfer Engineers, Inc.
  - 4. Northwest Engineering Services
  - 5. Pacific Coast Air Balance
  - 6. Accurate Balancing Agency, Inc.
  - 7. Precision Test and Balance, Inc.
- B. Other Firms: Submit substitution requests prior to bid date.
- C. Industrial Standards: Testing and Balancing shall conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:
  - 1. NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
  - 2. ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
  - 3. ANSI:
    - a. S1.4 Specifications for sound level meters.
    - b. S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.
- D. Instrument Certification: Instruments used shall be accurately calibrated and certified within six months of balancing and maintained in good working order.
- E. Test Observation: If requested, the tests shall be conducted in the presence of the Architect or the Architect's representative.
- F. Pre-Balancing Conference:
  - 1. Prior to starting balancing, general techniques shall be reviewed with the Engineer. This conference must occur prior to measuring existing conditions.

2. Measuring of existing conditions must occur prior to any demolition or new work.
3. The conference will review existing conditions and systems to be affected by the project

#### 1.4 SUBMITTALS

##### A. Submit the following:

1. Balancing Log – Existing Systems: Submit preliminary report indicating existing conditions prior to making any modifications to existing systems.
  - a. Systems: Fan System FU-2 and all associated air terminal units, motorized dampers.
  - b. Include all air outlets, actual field measured air volume, and percentage of design volumes.
  - c. Provide drawings identifying location of all outlets.
2. Equipment Data Sheets – Existing Systems:
  - a. Systems: Fan System FU-2
  - b. Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
3. Balancing Log:
  - a. Include all air outlets, actual field measured air volume, and percentage of design volumes.
  - b. Provide drawings identifying location of all outlets.
4. Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
5. Additional Data: Submit additional data as provided by Associated Air Balance Council (AABC) Standard forms.
6. Number of Copies: Submit six copies of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
7. Instrument Certification: When requested, submit certificate of calibration for equipment to be used.

##### B. Record data on NEBB forms or forms approved by the Architect.

#### 1.5 PROJECT CONDITIONS

- A. Where existing systems are to be adjusted, establish flow rates in all branches prior to making any modifications to system. Adjust central equipment as required and restore all unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.
- B. Do not perform final testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed and operating continuously as required.
- C. Conduct air testing and balancing with clean filters in place.

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## 1.6 WARRANTIES

- A. In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

## PART 2 - PRODUCTS – NOT APPLICABLE

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. Balance to maximum measured flow. Deviation from specified values of  $\pm 10$  percent at terminal device and  $\pm 5$  percent at equipment, or mean sound level deviation of 15 decibels. Advise Engineer if deficiencies are generally noted to enable proper corrective actions.

### 3.2 AIR SYSTEMS

- A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.
- B. Preliminary:
  - 1. Identify and list size, type, and manufacture of all equipment to be tested including air outlets and inlets.
  - 2. Use manufacturer's ratings for equipment to make required calculations except where field test shows ratings to be impractical.
- C. Central System:
  - 1. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment.
  - 2. Read and adjust air supply, return, and exhaust fan units to deliver design conditions at minimum OSA and at 100 percent OSA.
  - 3. Adjust automatic dampers, outside air, return air, and exhaust dampers for design conditions.
  - 4. Read static air pressure conditions on all air handling equipment including filter and coil pressure drops and total pressure across the fan. A Dwyer Series 400 air velocity meter only shall be used for final static pressures at equipment and where critical readings are required.
  - 5. Measure temperature conditions across all outside air, return air, and exhaust dampers to check leakage.
  - 6. Read and record motor data and amperage draw.
  - 7. For variable volume systems, establish minimum static pressure required at sensing point to permit operation over entire VAV range. Adjust supply and return fan speed so that at maximum demand the associated VFD is controlling the motor of motor nameplate RPM to 100 percent. Adjust return fan speed so that return air volumes track with supply air volume minus exhaust air volume.
  - 8. Assist controls contractor in establishing minimum outside air damper positions.

## D. Distribution:

1. Evaluate all building and room pressure conditions to determine adequate supply and return air conditions. Balance the building to be slightly positive to outdoors.
2. Evaluate all building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.
3. Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses shall be performed using a Dwyer Series 400 air velocity meter only with applicable duct probe.
4. Mark balancing dampers.

## 3.3 AUTOMATIC CONTROL SYSTEM

- A. In cooperation with control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.
- B. Testing organization shall verify all controls for proper calibration and list controls requiring adjustment by control system installer.

## 3.4 COORDINATION

- A. Coordinate work with other trades to ensure rapid completion of the project.
- B. Deficiencies noted during the course of air balancing in the mechanical installation shall be promptly reported to the Architect to allow corrective action to proceed.
- C. Periodic review of progress shall be provided as requested.

END OF SECTION

## SECTION 23 07 00 - INSULATION FOR HVAC

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes:
  - 1. Duct Insulation, Internal
  - 2. Duct, Pipe and Terminal Unit Acoustical Wrap

#### 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)
- C. Section 23 05 29, Hangers, Supports and Anchors for HVAC
- D. Section 23 31 01, HVAC Ducts and Casing – Low Pressure

#### 1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Prohibit insulating products from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
  - 2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
  - 3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.
- B. Protection:
  - 1. Protect against dirt, water, chemical, or mechanical damage before, during, and after installation.
  - 2. Repair or replace damaged insulation at no additional cost.
- C. Source Quality Control:
  - 1. Service: Use insulation specifically manufactured for service specified.
  - 2. Labeling: Insulation labeled or stamped with brand name and number.
  - 3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, not to react corrosively with equipment, piping, or ductwork, and asbestos free.

#### 1.4 SUBMITTALS

- A. Submit the following.
  - 1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

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**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

1. Duct Insulation, Internal:
  - a. Rectangular Ductwork:
    - 1) CertainTeed
    - 2) Johns Manville
    - 3) Knauf
    - 4) Owens Corning
2. Duct, Pipe and Terminal Unit Acoustical Wrap:
  - a. Kinetics Noise Control model KNM-100ALQ.

**2.2 DUCT INSULATION, INTERNAL****A. Fiberglass Duct Liner.**

1. Thermal Conductance: k-0.23 in accordance with ASTM C518 and ASTM C177 at 75 degrees F mean temperature.
2. Maximum Operating Temperature: 250 degrees F as determined by ASTM C 411.
3. Maximum Air Velocity: 6,000 fpm as determined by ASTM C 1071.
4. Fungi Resistance:
  - a. Does not breed or promote as determined by ASTM C1338.
  - b. No growth as determined by ASTM G21.
5. Bacteria Resistance: No growth as determined by ASTM G22.
6. Flame-spread index of 25 or less as determined by ASTM E 84 or UL 723.
7. Smoke development index of 50 or less as determined by ASTM E 84 or UL 723.
8. Acoustical Absorption Coefficients:
  - a. NRC value as tested in accordance with ASTM C423, type A mounting:
    - 1) 1-inch thickness: Minimum NRC 0.70
    - 2) 2-inch thickness: Minimum NRC 0.90

**2.3 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP****A. Barrier:**

1. Construct barrier of a 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side.
2. Nominal density of 1 pound per square-foot and minimum STC rating of 28.
3. Minimum thermal conductivity value of 0.29 and a rated service temperature range of -40 degrees F to 220 degree F.
4. Flame spread index of no more than 10 and a smoke development index of less than 40.

**B. Decoupling Layer:**

1. Combination of 1-inch fiberglass batting, non-woven porous scrim-coated glass cloth, quilted together in a matrix of 4-inch diamond stitch pattern, which encapsulates the glass fibers.

- C. Composite Material: Fabricated to include a nominal 6-inch wide barrier overlap tab extending beyond the quilted fiber glass to facilitate a leak-tight seal around field joints.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Workmanship:
1. Installation: Insulation installed in first class, neat professional manner.
  2. Applicators: Employ by firm that specializes in insulation work.
- B. Preparation: Surfaces of piping, ductwork, and equipment clean, free of oil or dirt, and dry before insulation is applied.
- C. Stamps: ASME stamps, UL labels, and similar stamps and labels not covered.

### 3.2 DUCT INSULATION APPLIED LOCATIONS

- A. General:
1. Internally lined completely to grille or diffuser or to indicated terminal points. Dimension shown are net inside of liner.
  2. Internally lined ductwork need not be externally insulated.
  3. In addition to locations described in specification, internally line medium, low, return and exhaust air ductwork where shown on drawings.

B. Insulation Applied Location – HVAC Ductwork:

System	Location	Duct Type	Insulation Type	Thickness	Notes
Transfer Air	All	All	Internally Lined	1-inch	
* In addition to applied locations listed in this table, provide internally lined ductwork where indicated on drawings.					

### 3.3 DUCTWORK INSTALLATION

- A. General:
1. Install in accordance with manufacturer's instruction.
  2. Continuous vapor barrier. Coat with vapor barrier mastic and patch with facing or tape. Joints between insulation and access with vapor barrier mastic.
  3. Insulation at access panels to be removable or attached to panel with edges of panel and opening reinforced with metal beading.
- B. Internal Duct Liner:
1. Air stream coated surface.
  2. Weld pins spaced maximum of 15-inch on center in both directions and within 2-inches of corners and joints. Weld pins flush with liner surface.
  3. Complete duct surface coated with adhesive and insulation pressed tightly thereto.
  4. Provide edges at terminal points with metal beading and heavily coated with adhesive.
  5. Heavily coat joints and corners with adhesive.

6. Damaged areas replaced or heavily coated with adhesive.

### 3.4 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP

- A. Installed in accordance with the manufacturer's instructions.
- B. Applied locations for piping and duct systems:
  1. Variable and constant volume terminal units with maximum air volumes over 2000 cfm. Wrap installed such that control devices are easily accessible without circumventing the acoustical value.
  2. Where specified or indicated on drawings.

### 3.5 FIELD QUALITY CONTROL

- A. Field Test: Test and approve systems prior to installation of insulation.
- B. Existing Insulation:
  1. Repair existing insulation damaged during construction.
  2. Make neat connections where new and existing insulation meet.
  3. Where existing ductwork or equipment is removed, cover existing surfaces neatly to match existing.
  4. Where existing insulation is damaged or missing, notify the architect prior to performing to work.

END OF SECTION



## SECTION 23 09 00 - INSTRUMENTS AND CONTROLS FOR HVAC

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Materials and Equipment
  - 2. Control Devices
  - 3. DDC Field Panels
  - 4. Connection to Existing Network
  - 5. BACnet Compatibility
  - 6. Input/Output Functions

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)
- C. Section 23 05 93, Testing, Adjusting and Balancing

## 1.3 QUALITY ASSURANCE

- A. Provide control work by single company with specialists in the type of work required, so that only one control manufacturer is responsible for control and automation work for project.
- B. Provide coordination with other contractors or subcontractors for work required by other trades for accomplishment of control work.
- C. Prior to substantial completion, controls contractor must demonstrate to Owner that system is operating per the Specifications and final adjustments have been made as approved.
- D. System, including components and appurtenances, configured and installed to yield a Mean Time Between Failure (MTBF) of at least 1,000 hours.

## 1.4 SUBMITTALS

- A. System Drawings: Prepare on AutoCAD format and include the following:
  - 1. Equipment installation, block diagrams, and wiring diagrams.
  - 2. DDC panel physical layout and schematics.
  - 3. Sensor and control wiring and installation drawings which identify each component and show interconnected or interlocked components.
  - 4. Material and equipment descriptive material such as catalog cuts, diagrams, performance curves, and other data to demonstrate conformance with specifications.
  - 5. Details of connections to power sources, including grounding.

6. Details of surge protection device installations.
  7. Instrumentation and control diagrams.
  8. Complete a written description of control sequences.
  9. List of connected data points, including DDC panels to which they are connected, and input device (sensor, etc.).
  10. Valve and damper schedules indicating flows, pressure drops, CVs, and actuator type.
- B. Equipment Data: Submittals include complete data for materials, including field and system equipment.
- C. Software Data:
1. Submittals consist of complete descriptions of system, command, and applications software as specified.
  2. Include description of control sequences which are software based using detailed logic flow diagrams.
  3. Diagrams indicate logic used to achieve control sequence of calculation specified, and show relationship between control sequence and application software packages specified.
- D. Testing Submittals:
1. Provide test plan and test procedures for approval.
  2. Explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements of this specification and methods for simulating necessary conditions of operation to demonstrate performance of the system.
  3. Test plan and test procedures demonstrate capability of system to monitor and control equipment and to accomplish control and monitoring specified.
- E. Operation and Maintenance Manuals:
1. Provide three complete sets of manuals bound in loose-leaf binders within 30 days after completing acceptance tests.
  2. Identify each manual's contents on cover.
  3. Manuals include names, addresses, and telephone numbers of each subcontractor installing equipment and systems and of nearest service representatives for each item of equipment and each system.
  4. Place tab sheets at beginning of each chapter or section and at beginning of each appendix.
  5. Final copies delivered after completion of the acceptance tests include modifications made during installation, checkout, and acceptance.
  6. Operation and Maintenance Manuals to include hardware manual, software manual, operations manual, and maintenance manual.
  7. Hardware Manual: Furnish a hardware manual describing equipment provided, including:
    - a. General description and specifications.
    - b. Installation and checkout procedures.

- c. Equipment electrical schematics and layout drawings.
  - d. System schematics and I-O wiring lists.
  - e. Alignment and calibration procedures.
8. Software Manual:
- a. Describe furnished software.
  - b. Oriented to programmers and describe calling requirements, data exchange requirements, data file requirements and other information necessary to enable proper integration, loading, testing, and program execution.
  - c. Provide one software manual per Operator's Terminal.
9. Operator's Manual: Provide procedures and instructions for operation of the system, including:
- a. DDC Panels and Peripherals
  - b. System start-up and shutdown procedures.
  - c. Use of system, command, and applications software.
  - d. Alarm Presentation
  - e. Recovery and Restart Procedures
  - f. Report Generation
  - g. System Schematic Graphics
  - h. Provide one Operator's Manual per Operator's Terminal
10. Maintenance Manual: Provide descriptions of maintenance for equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
11. Acceptance Test Forms: Maintenance manual includes copies of signed-off acceptance test forms.

## 1.5 ACCEPTANCE TESTING AND TRAINING

### A. Site Testing:

- 1. General: Provide personnel, equipment, instrumentation, and supplies necessary to perform testing. Owner or Owner's representative will witness and sign off on acceptance testing.
- 2. Acceptance Test: Demonstrate compliance of completed control system with contract documents. Using approved test plan, physical and functional requirements of project demonstrated.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Johnson Controls by JCI (existing BAS)
- B. Unless otherwise noted, installed by manufacturer.
- C. Other Manufacturers: Submit substitution request.

### 2.2 SYSTEM DESCRIPTION

#### A. General:

- 1. Connect to existing control system, consisting primarily of electronic direct digital control devices.

2. System consists of modular and distributed microprocessor based control and monitoring units connected together by communications trunks. Capable of global data sharing and communication between controllers.
  3. System architecture distributed and not rely on central processing unit (CPU) for sharing point data between controllers, or for control functions requiring data from other controllers.
  4. Multipurpose controller(s) consisting of CPU, system program, memory, power supply, and input/output drivers which communicated with terminal equipment controllers through a communications network.
  5. Provide equipment, installation, wiring, and accessories as required but not necessarily specified to accomplish operations as described.
- B. Environmental Conditions:
1. Rate DDC panels and other field equipment for continuous operation under ambient environmental conditions of 35 degrees F to 120 degrees F dry bulb and 10 percent to 95 percent relative humidity, noncondensing.
  2. Instrumentation and control elements rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installation.
  3. Install control devices in an enclosure suitable for the installed environment.
- C. System Accuracy and Display:
1. DDC system to control space temperature with a range of 50 degrees F to 85 degrees F  $\pm 1$  degrees F for conditioned space (display to nearest 0.5 degrees F); 15 degrees F to 130 degrees F  $\pm 1$  degrees F for unconditioned space (display to nearest 0.5 degrees F). Return air humidity controlled to 20 percent RH to 35 percent RH  $\pm 3$  percent RH.
  2. DDC system to control duct temperature with a range of 40 degrees F to 140 degrees F  $\pm 1$  degrees F (display to nearest 0.5 degrees F).
  3. Pressure with a range for the specific application  $\pm 5$  percent of range.

## 2.3 MATERIALS AND EQUIPMENT

- A. Controls and Power Wiring:
1. General: Electric equipment and wiring in accordance with Division 26, Electrical. Manual or automatic control and protective or signal devices required for operation specified, and control wiring required for controls and devices.
  2. Wiring:
    - a. Field and Subfield Panels:
      - a) Voltage in panels not to exceed 120V. Where devices are wired to higher voltages, mount in suitable individual enclosures or group in separate control panel.
      - b) Coordinate electrical power supply with Division 26.
    - b. Motor Control Centers: Responsibility for correct voltage of holding coils and starter wiring in pre-wired motor control centers interfacing with automatic controls is included hereunder.

- c. Wiring for DDC systems communications buses two conductor minimum 18 gauge foil-shielded, stranded twisted pair cable rated at 300 VDC or more than 80 degrees C.
3. Communications Links Surge Protection: Protect communications equipment against surges induced on any communications link. Cables and conductors which serve as communications links have surge protection circuits installed that meet the requirements of REA PE-60d.
4. Communications Links Overvoltage Protection: Protect communications equipment against overvoltage on any communications link conductors. Cables and conductors which serve as communications links have overvoltage protection for voltages up to 480 VAC rms, 60 Hz installed. Instrument fuses or fusible resistors are acceptable for this application.
5. Power Line Surge Protection:
  - a. Protect equipment connected to AC circuits from power line surges.
  - b. Do not use fuses for surge protection.
- B. Control Panels:
  1. Provide wall-mounted control panels as required to contain relays, terminal strips, power supplies and other equipment in building control system.
  2. UL listed, minimum NEMA 1, minimum 14 gauge steel with stiffeners, continuous hinge doors, locking handles, single point latch.

## 2.4 CONTROL DEVICES

- A. Temperature Instruments:
  1. Room Temperature Sensors: Platinum RTD type with accuracy of  $\pm 0.4$  degrees F at 70 degrees F; operating range 30 to 120 degrees F; linear to DDC system; single point sensing element in wall-mounted ventilated enclosure with insulating back plate if mounted on exterior wall.
    - a. Provide sensor with digital display.
    - b. Sensor to have user adjustment based on DDC programmed offset.
  2. Duct Temperature Sensors: Platinum RTD element with accuracy of  $\pm 0.5$  degrees F at 32 degrees F, averaging type consisting of array of single point sensing elements, securely mounted in duct or plenum; operating range 0 to 100 degrees F; linear signal; 20-foot element.
- B. End Switches:
  1. Turret head type SPDT
  2. Manufacturer:
    - a. Square D Class 9007, Type C54B2
    - b. Or equal.
- C. VAV Actuators:
  1. Proportional 24 VAC actuators using a 4 to 20 mA range of control signals.
  2. Stop automatically at end of travel and include a permanently lubricated gear train.
  3. Furnished by the controls manufacturer and factory installed and tested by the terminal unit manufacturer.

- D. Carbon Dioxide Sensor: Infrared sensing, Carbon Dioxide gas monitor. Based on Airstest TR9290 series.
1. Detection Range: 0-2000 ppm
  2. Accuracy: +/- 3 percent of measured value
  3. Response Time: 2 minutes
  4. Outputs: 0-10V, 4-20 mA
  5. Calibration: Self-calibrating, calibration not required
  6. Power Requirement: 24 VAC/VDC  $\pm$ 20 percent, 50-60Hz (half-wave rectified)
  7. Operating Temperature Range: 32 degrees F to 122 degrees F
  8. Operating Humidity Range: 0 percent - 95 percent RH, Non-Condensing
  9. Display: Do not provide a digital display with the sensor.

## 2.5 DDC FIELD PANELS

- A. Multipurpose Controllers:
1. Stand-alone microprocessor based panels, enclosed in sturdy metal enclosure with two standard RS232 interface ports, network communications module, power supply, and battery back-up.
  2. Panels will be used to connect field sensors and control devices. Fully supervise each panel to detect failures. Construct panel so functions are implemented on replaceable circuit boards to permit field maintenance. Completely field programmable through portable terminal. Minimum 8-hour battery backup system.
  3. Each DDC panel linked with data trunk cable to other controllers and Operator's Terminals to distribute information. Field panels continuously exchange data through trunk cable without requiring output to input wiring between panels. The system arranged so that operations are maintained without the central computer being connected to the system.
  4. Upon failure of the DDC field panel, including transmission failure, the panel automatically forces the controls to remain in the last command status.
  5. Provide a real time clock with calendar maintaining seconds, minutes, hours, and days of the week, accurate to  $\pm$ 10 seconds per day.
  6. Provide sufficient memory to perform specified and shown DDC field panel functions and operations, including spares. Each DDC panel to have 10 percent minimum spare memory board spacing.
  7. Each DDC field panel contain hardware to support power fail automatic restart.
  8. Provide locking type mounting cabinets with common keying.
  9. DDC field panel have built-in diagnostics to display to operator interface terminal any sensor transmitting signal out of its design range.
  10. Control logic done with software resident in each local DDC panel. Auxiliary relays may be used only when required for load contact rating.
  11. Panels UL listed.

**B. Terminal Equipment Controller:**

1. Terminal equipment controllers provided for each piece of equipment, as specified, and includes point inputs and outputs as necessary to perform specified control sequences.
2. Each controller performing space temperature control provided with a matching room temperature sensor, which include terminal jack to monitor hardware and software associated with controller.
3. Each room sensor includes setpoint adjustment dial, temperature indicator, and override switch. Override switch overrides night setback mode to normal (day) mode when activated by occupant. Adjustment dial and override switch may be locked out, overridden, or limited through software from central workstation or portable terminal.
4. Each controller independent of other network communications. Controller receives real time data from central workstation or multipurpose controller.
5. Controller utilizes proportional, integral, and derivative (PID) algorithms which is field adjustable.
6. Database and sequence of operation programs stored in non-volatile EEPROM and EPROM.
7. Controllers networked through communications link to the multipurpose controller.
8. Controllers powered from 24 VAC source. Provide dedicated power source. Coordinate with Division 26.
9. VAV box controllers include differential pressure transducer connected to manufacturer's standard velocity sensor, and includes provisions for both automatic and manual calibration of transducer to ensure against drift. Incorporate algorithm to allow for modulation of hot water heating valve, and supplementary hot water radiation valve. Fan-powered terminal units control series or parallel fan as appropriate. Provide fan status proof current switch.

**2.6 CONNECTION TO EXISTING NETWORK**

- A. General: Communication between peer-to-peer DDC control panels via TCP/IP over the existing Ethernet system.
- B. Provide software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing paging system.

**2.7 BACNET COMPATIBILITY**

- A. DDC System and components BACnet Data Communications Protocol compliant.
- B. System fully integrated and installed as a complete package of BACnet compliant controls and instrumentation.
- C. Capable of seamless BACnet integration with existing BACnet compliant devices as well as future BACnet compliant devices.
- D. No portals or third party devices required for integration with existing or future equipment.
- E. Devices utilized in the BACnet interface BACnet Testing Laboratories (BTL) listed and labeled.

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## 2.8 INPUT/OUTPUT (I/O) FUNCTIONS

- A. Analog Inputs (AI):
  1. AI function monitors each analog input, perform A-to-D conversion, and hold the digital value in a buffer for interrogation.
  2. Provide signal conditioning for each analog input.
  3. Individually calibrate analog inputs for zero and span, in hardware or in software.
  4. Minimum 12 bit A to D resolution.
- B. Analog Outputs (AO):
  1. The AO function accepts digital data, perform D-to-A conversion, and output a signal compatible with the operator.
  2. Individually calibrate analog outputs for zero and span.
  3. Provide short circuit protection.
  4. Minimum 8 bit D to A resolution.
- C. Digital Inputs (DI):
  1. DI function accepts ON/OFF, OPEN/CLOSE or other change of state (two-state data) indications.
  2. Provide isolation and protection against input voltage up to 180 Vac peak.
- D. Digital Outputs (DO):
  1. DO function provides contact closures for momentary and maintained operation of output devices.
  2. Closures have a minimum duration of 0.1 second.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Mounting Panels: Locate panels where shown on Drawings or near item of equipment to be controlled, but not on equipment itself.
- B. DDC Field Panels: Provide number of panels required to accommodate DI, DO, AI, and AO points and hardware and software to accomplish specified control sequenced. Locate panels in mechanical or electrical rooms. Submit proposed locations for approval prior to preparing control drawings.
- C. Electrical:
  1. Provide control wiring for control devices and control panels.
  2. Run control wiring in mechanical rooms or locations susceptible to damage in conduit. Plenum rated cable may be used in other locations.
  3. Provide power wiring for control devices and control panels. Utilize designated circuits in electrical power panels. Refer to Electrical Drawings. If no circuits are designated for DDC Controls, submit detailed request for use of spare circuits at no additional cost.
  4. Install power wiring in conduit.



5. Grounding: Instrumentation and communication grounding installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
  6. Control voltage limited to maximum of 120V.
  7. Where relay coil is connected to load side of motor starter to energize with motor operation, external control circuit properly fused with fuse block located in respective starter enclosure.
  8. Where relays are used to control single-phase motors directly, provide contacts rated for not less than horsepower rating of largest motor switched by relay.
- D. Identification: Provide engraved nameplates identifying switches, lights and starters, and each control device where control function is not readily apparent.
- E. Room Thermostats and Room Sensors:
1. Wall Thermostats and Room Sensors with User Adjustment: Mount at height of 48-inches above finished floor.
  2. Wall Thermostats and Room Sensors without User Adjustment: Mount at height of 60 inches above finished floor.
  3. Provide insulating back on thermostats mounted on exterior walls.
  4. Provide one thermostat for each zone of temperature control.
  5. Submit proposed locations for approval prior to preparing control drawings, where not shown or alternate location is proposed.
- F. Carbon Dioxide Sensor:
1. Mount sensor at 5 feet above finished floor or as indicated on the plans.
  2. Provide sensor quantity as indicated on plans or as required by sensor coverage rating (maximum 20-foot radius).
  3. Alarm above 850 ppm.
  4. Refer to sequence of operations for more information on sensor use.

END OF SECTION

## SECTION 23 09 93 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

## 1.2 RELATED WORK

- A. This Section shall be used in conjunction with the following other specifications and related Contract Documents to establish the total requirements for the system:
  - 1. Section 23 05 00, Common Work Results for HVAC.
  - 2. Section 23 05 93, Testing, Adjusting & Balancing
  - 3. Section 23 09 00, Instrumentation and Controls for HVAC
  - 4. Section 23 34 00, HVAC Fans

## 1.3 SUBMITTALS

- A. Reference Section 23 09 00, Instrumentation and Controls for HVAC for required submittals.

## 1.4 SEQUENCES OF OPERATION

- A. Reference Section 23 09 00, Instrumentation and Controls for HVAC for required submittals.

## 1.5 GENERAL REQUIREMENTS

- A. General:
  - 1. Sequences of Operation for all equipment are described in PART 2 – SEQUENCES OF OPERATION below.
  - 2. All system functions and operations shall be accomplished by the DDC controller, except where explicitly defined as hard-wired, stand-alone, or factory-installed equipment controls.
  - 3. Where factory-installed equipment controls are furnished as specified under other Sections, install and wire all switches, sensors, accessories and other control devices and wiring required for a complete operational system. Set up and adjust all controls to perform the sequences described below.
  - 4. Provide all devices, materials, equipment, software, wiring, labor and engineering necessary to achieve the Sequences of Operation described in Part 2 below.
  - 5. Provide all hard wired and virtual control points necessary to meet each sequence of operations described in this section. Include all hard wired points indicated on the equipment control diagrams.

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PART 2 - PRODUCTS

## 2.1 SEQUENCES OF OPERATION - VARIABLE VOLUME AIR HANDLING UNIT (FAN UNIT 2)

- A. System Equipment:
  - 1. Existing Air Handling Unit (FU-2)
  - 2. Variable Air Volume Terminal Units (VAV)
- B. General:
  - 1. The existing Air Handling Unit Fan System FU-2 to operate according to the current building automation system sequence of operations and scheduling.
- C. Single Duct Variable Volume Air Terminal Unit (VVR):
  - 1. General:
    - a. Pressure Independence: Counteract changes in airflow caused by system pressure changes by monitoring static and velocity pressure at Air Terminal Unit inlet and adjusting the Damper position accordingly.
    - b. Airflow Measurement: Calibrate controller using manufacturer's data to provide correct reading of airflow through Air Terminal Unit. Provide auto-recalibration sequence to maintain accuracy.
  - 2. Air Terminal Unit Scheduling:
    - a. The Air Terminal Unit shall follow the schedule of the associated Air Handling Unit Fan System FU-2.
  - 3. Unoccupied Cycle:
    - a. The Unoccupied Cycle shall be identical to the Occupied Cycle, with the following exceptions:
      - 1) Space temperature setpoints shall be 62 degrees F (heating, adjustable) and 85 degrees F (cooling, adjustable).
      - 2) Optimal Start Control: When the associated Air Handling Unit – FU-2 is operating in the Warm-up or Cool-down Mode, the space temperature setpoints will be equal to the Occupied Cycle setpoints.
  - 4. Occupied Cycle:
    - a. Space temperature setpoints (adjustable) shall be 75 degrees F for cooling and 70 degrees F (adjustable) for heating.
    - b. Occupied Cycle Operation:
      - 1) Modulate the Damper to vary the airflow between its cooling maximum (adjustable) and cooling minimum (adjustable) to maintain the temperature setpoint (adjustable) at the space temperature sensor. If the supply air temperature is greater than the space temperature setpoint, set damper to minimum position.
  - 5. Minimum CFM Reset (Demand Based Ventilation): Monitor CO2 sensors located at interior locations shown on the Drawings. Reset the minimum CFM as follows:
    - a. For spaces with CO2 sensors the minimum primary CFM shall be reset between the scheduled Maximum CFM and the scheduled Minimum CFM as required to maintain 1000 PPM of CO2 level setpoint (adjustable).
  - 6. Shutdown Mode:
    - a. Close damper.

## 2.2 RESTART AFTER LOSS OF POWER

### A. Restart Mode:

1. Each panel of the DDC system is served by UPS power.
2. Monitor a potential transformer located in the main electric service to the building.
3. If service to the building is lost, sequence restarting of all controlled equipment to minimize power demand load.

### B. Alarms/Safeties:

1. High Temperature Alarm: Generate an alarm in the event the space temperature exceeds the high limit (80 degrees F, adjustable).

## PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION

## SECTION 23 31 01 - HVAC DUCTS AND CASING-LOW PRESSURE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes:
  - 1. Supports, Anchorage and Restraints
  - 2. Sheet Metal Ductwork
  - 3. Exposed or Visible Ductwork in Finished Spaces

#### 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)
- C. Section 23 07 00, Insulation for HVAC

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the manual of Duct and Sheet Metal Construction of the Sheet Metal and Air Conditioning Contractors National Association and these Specifications.
- B. Regulatory Requirements:
  - 1. Entire ductwork system, including materials and installation, installed in accordance with NFPA 90A.
  - 2. Ductwork and components UL 181 listed, Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

#### 1.4 SUBMITTALS

- A. Submit the following:
  - 1. Provide catalog data on each product specified hereunder.
  - 2. Schedule of duct construction standards.
  - 3. Provide shop drawings showing materials and construction details for single wall housing plenum.
  - 4. Provide shop drawings showing construction details, support, and seismic restraint of ductwork distribution systems.

### PART 2 - PRODUCTS

#### 2.1 SUPPORTS, ANCHORAGE AND RESTRAINTS

- A. General:
  - 1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for ductwork are not shown on the Drawings, and response for design.

2. Resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
  3. Seismic restraints follow provisions described in Section 23 05 48, Vibration and Seismic Control for HVAC Piping and Equipment.
  4. Seismic restraints not to introduce stresses in the ductwork caused by thermal expansion or contraction.
  5. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- B. Suspended Ductwork: Seismic restraints in accordance with the latest edition of the SMACNA, Seismic Restraint Manual - Guidelines for Mechanical Systems for the seismic hazard level corresponding to the seismic zone in which the project is constructed.
- C. Engineered Support Systems: The following support systems designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction:
1. Supports and seismic restraints for suspended ductwork and equipment.
  2. Support frames for ductwork and equipment which provide support from below.
  3. Equipment and ductwork support frame anchorage to supporting slab or structure.

## 2.2 SHEETMETAL DUCTWORK

- A. Fabricate from galvanized steel, unless noted otherwise.
- B. Minimum gauge, duct construction, joint reinforcing, fittings, hangers, and supports in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, Latest Edition.
- C. Duct Classification: Ducts considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2-inches wg positive or negative.
1. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1/2-inch wg positive or negative.
    - a. Supply ductwork downstream from terminal units.
    - b. Supply, return or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch wg
    - c. Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.
  2. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch wg positive or negative.
    - a. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1-inch wg. On supply fans pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.
    - b. Supply, return, or exhaust ductwork serving multiple duct branches where contractor can demonstrate that pressures will not exceed 1-inch wg positive or negative.
    - c. Boiler direct vent combustion air intake ductwork.
    - d. Water heater direct vent combustion air intake ductwork.

3. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 2-inches wg, positive or negative.
  - a. Supply, return, or exhaust ductwork serving fans scheduled to operate at pressures greater than 1-inch wg positive or negative.
- D. Longitudinal seams on rectangular duct, Pittsburgh or Button punch snap lock. Snap lock seams for round duct may be used only on ducts classified for 1/2-inch wg. Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1-inch wg or less.
- E. Joining and reinforcing systems manufactured by Ductmate, Roloc, or TDC are acceptable. Ductmate 35 is equivalent to SMACNA J, and Ductmate 25 is equivalent to SMACNA F.
- F. Use of adjustable round elbows not permitted.

### 2.3 EXPOSED OR VISIBLE DUCTWORK IN FINISHED SPACES

- A. Round:
  1. Material:
    - a. Round or flat oval, machine formed, spiral lock-seam galvanized sheet metal ductwork of thicknesses as listed for sheet metal duct.
    - b. Paintable surface.
  2. Fittings: Machine formed, shop fabricated, with welded seams, designed for easiest air flow, similar to United Sheet Metal numbers listed.
    - a. Mitered Elbow with Turning Vanes: Type EV-90-2.
    - b. Radius Elbows: Type E090-5. Similar for less than 90 degree elbows.
    - c. Tees: Type Con-T-1.
    - d. Reducing Fittings: May be used unless noted otherwise.
- B. Rectangular:
  1. Same as for sheet metal ductwork but paintable surface.
  2. Inside reinforcing.
  3. Use special care to prevent imperfections in the metal surface.

## PART 3 - EXECUTION

### 3.1 APPLIED LOCATIONS

- A. Supply ductwork on downstream side of terminal box. Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.
- B. Ductwork between Transfer Grilles: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.
- C. Exposed or Visible Ductwork in Finished Spaces: Sheet metal as specified for application, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.

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### 3.2 INSTALLATION

#### A. Ductwork:

1. Seal traverse joints with an approved mastic during joining procedure or tape after joining to provide airtight duct system.
2. Low pressure ductwork hanger and support systems in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible. Wire supports are not allowed.
3. Provide supplementary steel for support of ductwork in shafts and between building structural members.
4. Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends or fixed turning vanes in square elbows. Radius elbows less than 1.5D radius, splitter vanes.
5. Change in duct size or shape necessitated by interference made using rectangular equivalents of equal velocity.

#### B. Sound Attenuation (internal insulation):

1. Provide sound attenuation duct where shown and as specified under Section 23 07 00, Insulation for HVAC.

#### C. Extractors: Install behind ducted supply grilles diffusers.

#### D. Ductwork, Exposed or Visible in Finished Areas:

1. Use extreme care in handling and installing.
2. Replace dented or damaged sections.
3. Install ductwork straight and true, parallel to building lines.
4. Make connections with pop rivets using couplings where applicable. Grind raw edges smooth and apply paintable sealant to cover imperfections.
5. Remove excess sealant to provide a finished joint.
6. Provide floor, wall, and ceiling plates as specified in Section 23 05 00, Common Work Results for HVAC.
7. Finish, clean and prime ductwork, and hangers for painting.

### 3.3 FIELD QUALITY CONTROL

#### A. Coordination with Balance Agency:

1. Provide services of a sheet metal person familiar with the system ductwork to provide assistance to the balancing agency during the initial phases of air balancing in locating sheet metal dampers.
2. Install missing dampers required to complete final balancing.

END OF SECTION



## SECTION 23 34 00 - HVAC FANS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. High Volume Low Speed Ceiling Fans

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

## 1.3 SUBMITTALS

- A. Submit the following:
  - 1. Shop Drawings: Showing dimensions, details of construction.
  - 2. Product Data: Showing performance of fans.
  - 3. Operation and Maintenance Data
  - 4. Submit certified sound power ratings for each fan.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. High Volume Low Speed Ceiling Fans:
  - 1. Big Ass Fans
  - 2. Other Manufacturers: Submit substitution request.

## 2.2 HIGH VOLUME LOW SPEED CEILING FANS

- A. Description: High volume low speed ceiling fan as indicated, standard factory finish, TUV-certified and built pursuant to the construction guidelines set forth by UL standard 507.
- B. Fans:
  - 1. The fan shall be equipped with eight high volume, low speed airfoils of precision extruded, anodized aluminum alloy. The airfoils shall be connected to the hub and interlocked with stainless steel retainers.
  - 2. The fan shall be equipped with eight upswept winglets designed to redirect outward airflow downward. Winglets shall be molded of high strength polymer and shall be attached at the top of each airfoil.
- C. Motor:
  - 1. The motor shall be a permanent magnet brushless motor rated for continuous operation at maximum speed with the capability of modulating the fan speed from 0-100 percent without the use of a gearbox or other mechanical means of control.

2. Operation the motor from any voltage ranging from 100-120 VAC or 200-240 VAC, single phase, and 60Hz, without requiring adapters. Non-ventilated, heat sink design with the capability of continuous operation -4 degrees F to 131 degrees F ambient condition.
- D. Hub:
1. The fan hub shall be constructed of zinc plated steel for high strength and durability. The hub shall be precision machined to achieve a well-balanced and solid rotating assembly.
- E. Safety Cable:
1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be fabricated out of galvanized steel, pre-loaded and tested to 3,200 lbf.
  2. Field construction of safety cables is not permitted.
- F. Wall Control:
1. Wireless: Equip the fan with a radio frequency (RF) remote wall control. The wall control shall provide control of all fan functions. The wall control shall be capable of mounting to a standard electrical box with a supplied wall plate and shall include a capacitive touch display for controlling the fan's power and speed. Communication with the fan drive and controller shall be wireless.
- G. Fire Control Panel Integration:
1. Provide a 10-30 VDC pilot relay for seamless fire control panel integration.
- H. Guy Wires:
1. Guy wires shall be included for installations with extension tubes 4-feet or longer to limit potential for lateral movement.

### PART 3 - EXECUTION

#### 3.1 HIGH VOLUME LOW SPEED CEILING FANS

- A. Install fan free from obstacles such as lights, cables, or other building components.
- B. Interlock fans to shut down immediately upon receiving signal from the fire alarm system.

END OF SECTION

## SECTION 23 37 00 - AIR OUTLETS AND INLETS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Diffusers and Grilles

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 23, Heating, Ventilating, and Air Conditioning (HVAC)

## 1.3 SUBMITTALS

- A. Submit the following:
  - 1. Shop Drawings: Showing dimensions and details of construction.
  - 2. Product Data

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Where only Titus figure numbers are listed, equivalent products by the following manufacturers by using only one:
  - 1. Carnes
  - 2. Price
  - 3. Krueger
  - 4. Tuttle & Bailey
  - 5. Anemostat
  - 6. Nailor
  - 7. Other Manufacturers: Submit substitution request.

## 2.2 DIFFUSERS AND GRILLES

- A. Drum Louver (H-1):
  - 1. Drum louver with 1-1/4-inch steel borders, (opposed blade dampers), counter sunk screw holes, extruded aluminum drum, rotatable 25 degrees up/down from centerline, individually adjustable blades, white baked enamel finish.
  - 2. Titus model DL.
- B. Wall Transfer Grille (H-2):
  - 1. Aluminum 45 degree fixed single deflection, horizontal blades 3/4-inch spacing 1-1/4-inch border, gasketed around face flange, white baked enamel finish.
  - 2. Price 60.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install diffusers tight to their respective mounting surfaces.
- B. Installed plumb and true with room dimensions and accurately centered on projections as shown on the Architectural reflected ceiling plans.
- C. Install extractors behind duct mounted sidewall supply grilles, and where shown. Turning vanes allowable if condition is the last outlet on a branch.
- D. Set pattern control for directions of throw as shown on Drawings prior to air balancer arriving on Project.
- E. Paint ductwork behind outlets flat black.

### 3.2 PERFORMANCE

- A. Unit sizing is based on air being introduced at 20 degrees F temperature differential and being diffused at the 5-foot level to a velocity not greater than 50 FPM and a temperature differential not greater than 1.5 degrees F. Units are also selected so as not to exceed the NC-30 curve.

END OF SECTION

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**SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes Design-Build work.
- B. The intent of Division 26, Electrical Specifications and Drawings is to provide a complete and workable facility, with complete systems as required by applicable codes, as indicated, and as specified.
- C. Include work specified in Division 26, Electrical and as indicated on Drawings. Include appurtenances, connections, fasteners, and accessories required to make a complete working system, whether indicated or not indicated.
- D. Refer to Division 01, General Requirements.

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 26, Electrical

**1.3 REFERENCES**

- A. The latest adopted revisions of the publications listed below apply to these Specifications as referenced:
  - 1. IBC International Building Code
  - 2. NEC National Electrical Code
  - 3. NFPA National Fire Protection Association
  - 4. NEMA National Electrical Manufacturers Association
  - 5. NECA National Electrical Contractors Association
  - 6. ANSI American National Standards Institute
  - 7. IEEE Institute of Electrical and Electronic Engineers
  - 8. UL Underwriters Laboratories

**1.4 SYSTEM DESCRIPTION**

- A. Ground Systems:
  - 1. Provide complete ground systems indicated.
  - 2. Include conduit system, transformer housings, switchboard frame, and neutral bus, motors, and miscellaneous grounds required by Contract Documents and by applicable codes.
- B. System Identification:
  - 1. Clearly identify elements of the Project electrical system to indicate the loads served, or the function of each item of equipment, connected under this work.
  - 2. Comply with requirements of Division 26, Electrical, and with applicable codes.

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**C. Drawings:**

1. Drawings are diagrammatic. They do not show every offset, bend, tee, or elbow, which may be required to install work in the space, provided and avoid conflicts with other construction.
  - a. Prior to installing work, take field dimensions, and note conditions available for, installation.
  - b. Follow the Drawings as closely as practical to do so, and install additional bends, offsets, and elbows where required by installation conditions.
    - 1) Additional offsets, bends, and other connectors are subject to approval by Project Engineer.
    - 2) Install additional offsets, bends, and other connectors without additional cost to Owner.
  - c. The right to make any reasonable changes in outlet location prior to roughing in is reserved to the Owner's Representative.
2. Luminaire Designations:
  - a. Tags consisting of 'Zxxx' label adjacent to devices indicate control via lighting control system; refer to lighting control schedules for circuit connection and additional information.
  - b. Lower case letters adjacent to devices or luminaires indicate local control via device(s) located in the same space.
  - c. Numbers adjacent to devices indicate circuit connection.
3. Circuits and Switching:
  - a. Do not change branch circuiting and switching indicated; nor combine homeruns, without Engineer's prior approval.
  - b. Do not combine or change feeder runs.
4. Circuit Conductors:
  - a. Cross or hash marks on conduit runs indicate quantity of No. 12 copper branch circuit conductors, unless otherwise noted.
  - b. Where such marks do not appear, provide quantity of circuit conductors to the outlets shown to perform the control or circuiting indicated.
  - c. Include ground, travelers, and switch legs required by the circuiting arrangement indicated.
  - d. Provide a dedicated neutral conductor with each circuit. Do not use a shared neutral conductor between phases unless, requested or directed.

**1.5 SUBMITTALS**

- A. Comply with Division 01, General Requirements.
- B. Contractor Responsibilities:
  1. Submit submittals one time and in proper order.
  2. Ensure equipment will fit in the space provided.
  3. Deviations from the Drawings and Specifications specifically noted in the submittals. Failure to comply will automatically void any implied approval for use of the equipment on this project.
- C. Shop Drawings and Equipment Data:
  1. Combine electrical shop drawings and equipment data in Submittal binders.

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2. Include in Submittal binders:
    - a. Complete index of materials and equipment as required by Specifications to be documented by submittals.
    - b. Fully describe equipment furnish per manufacturer's detailed specifications.
    - c. All deviations from the Drawings and Specifications, noted on the submittals. Failure to comply will automatically void any implied approval for use of the equipment on this project.
  - D. Installation Drawings:
    1. Submit prior to starting installation.
    2. Show outlets, devices, terminal cabinets, conduits, wiring, and connections required for the complete system described.
  - E. Record Drawings:
    1. Keep record drawings up to date as the work progresses.
    2. Show changes, deviations, addendum items, change orders, corrections, and other variations from the Contract Drawings.
    3. Keep record drawings at the jobsite and available for the Architect's review.
    4. At the completion of the work, incorporate all deviations from the installation drawings to indicate as-built conditions.
  - F. Operation and Maintenance Data:
    1. As specified in Division 01, General Requirements.
    2. Provide a separate manual or chapter for each system as follows:
      - a. Low Voltage Distribution System
      - b. Emergency Power System (Lighting Inverter)
      - c. Fire Alarm System (system interface)
      - d. Lighting System
      - e. Lighting Control System
    3. Description of system.
    4. Operating Sequence and Procedures:
      - a. Step-by-step procedure for system start-up, including a pre-start checklist.
        - 1) Refer to controls and indicators by nomenclature consistent with that used on panels and in control diagrams.
      - b. Detailed instruction in proper sequence, for each mode of operation (i.e., day-night, staging of equipment).
      - c. Emergency Operation:
        - 1) If some functions of the equipment can be operated while other functions are disabled, give instructions for operations under those conditions.
        - 2) Include here only those alternate methods of operations (from normal) which the operator can follow when there is a partial failure or malfunctioning of components or other unusual condition.
      - d. Shutdown Procedure:
        - 1) Include instructions for stopping and securing the equipment after operation.

- 2) If a particular sequence is required, give step-by-step instructions in that order.
5. Preventive Maintenance:
    - a. Schedule for preventive maintenance.
      - 1) State the recommended frequency of performance of each preventive maintenance task such as cleaning, inspection, and scheduled overhauls.
    - b. Cleaning: Provide instructions and schedules for all routine cleaning and inspection with recommended lubricants.
    - c. Inspection: If periodic inspection of equipment is required for operation, cleaning, or other reasons, indicate the items to be inspected and give the inspection criteria.
    - d. Provide instructions for lubrication and adjustments required for preventive maintenance routines. Identify test points and given values for each.
  6. Manufacturers' Brochures:
    - a. Include manufacturers' descriptive literature covering devices and equipment used in the system, together with illustrations, exploded views, and renewal parts lists.
    - b. Clearly define manufacturers' standard brochures so that the information applying to the actual installed equipment.
  7. Results of performance testing, as specified in PART 3 of this Section.
- G. Submittals Procedures:
1. Review and recommendations by the Architect or Engineer are not to be construed as change authorizations.
  2. Either if discrepancies are discovered between the materials or equipment submitted, and the Contract Documents, prior to or after the data is processed, the Contract Documents govern.

## 1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Products and equipment comply with Oregon Revised Statute (ORS) 453.005(7)(e) prohibiting pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products or equipment within this specification contains these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
  2. Provide work and materials conforming to:
    - a. Local and State codes.
    - b. Federal and State laws and regulations.
    - c. Other applicable laws and regulations.
  3. Obtain and pay for all permits, licenses, and inspection certificates required by authorities having jurisdiction.
  4. Pay any other fees required by governing authorities for work of this Division.
- B. Install only electrical products listed by a recognized testing laboratory, or approved in writing by the local inspection authority as required by governing codes and ordinances.



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### 1.7 SITE VISITATION

- A. Visit the site prior to bidding and become familiar with existing conditions and other factors which may affect the execution of the work. Complete coordination of installation of equipment with prior bid packages previously issued. Include related costs in the initial bid proposal.

### 1.8 COORDINATION

- A. Coordinate Work of This Division with all other trades to ensure proper installation of electrical equipment.
  - 1. Review Drawings of other trades or crafts to avoid conflicts with cabinets, counters, equipment, structural members, and other possible impediments to electrical work.
  - 2. Report potential conflicts to the Architect prior to rough-in.
  - 3. Proceed with rough-in following Architect's directives to resolve conflicts.
  - 4. Architectural Drawings govern.
- B. Verify the physical dimension of each item of electrical equipment to fit the available space. Contractor's responsibility includes:
  - 1. Coordination of the equipment to fit into the available space.
  - 2. Access routes through the construction.
- C. Layout Drawings:
  - 1. Equipment arrangement shown on Drawings is diagrammatic to indicate general equipment sizing and spatial relationship. Include, as part of distribution equipment submittal, a scaled floor plan, which includes equipment shown with their submitted sizes. Include all feeder conduit routing, both aboveground and underground, including termination points at equipment. Submit for Engineer's review prior to commencing work.
  - 2. Provide additional wiring details at switchboards, motor control centers, and other areas where work is of sufficient complexity to warrant additional detailing for coordination.
  - 3. Submit layout drawings for approval prior to commencing field installation.
- D. Where electrical connections are required for equipment provided as Work of other Divisions, coordinate rough in and wiring requirements for that equipment with its supplier and installer prior to commencing work. Notify Architect and Engineer of any discrepancies between the actual rough in and wiring requirements, and those identified on Drawings for resolution prior to installation.
- E. Arrange raceways, wiring, and equipment to permit ready access to switches, motors, and control components.
  - 1. Keep doors and access panels clear.
- F. Coordinated Shop Drawings.
  - 1. Prepare in [wo-dimensional]format.

2. Include but are not limited to:
  - a. Fabrication drawings of architectural metal ceiling, including panel penetrations for lighting, sprinkler heads, fire alarm devices, and any other penetrations.

### 1.9 CHANGE ORDERS

- A. Supplemental cost proposals by the Contractor accompanied with a complete itemized breakdown of labor and materials. At the Architect's request, make available estimating sheets for the supplemental cost proposals. Separate and allocate labor for each item of work.

### 1.10 WARRANTY

- A. Provide a written warranty covering the work of this Division as required by the General Conditions.
  1. Incandescent Lamps: Excluded from this warranty.
- B. Apparatus:
  1. Free of defects of material and workmanship and in accord with the Contract Documents.
  2. Built and installed to deliver its full rated capacity at the efficiency for which it was designed.
  3. Operate at full capacity without objectionable noise or vibration.
- C. Include in Contractor's warranty for Work of Division 26, Electrical system damage caused by failures of any system component.

### 1.11 ALTERNATES

- A. Comply with Division 01, General Requirements.
- B. Refer to Electrical Drawings for detailed information relating to the appropriate alternates.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Where specified materials or methods conflict with applicable codes, the more stringent requirement applies.
- B. Provide apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.
- C. Ensure that entire electrical system operates at full capacity without objectionable noise or vibration.
- D. Materials and Equipment:
  1. Use materials and equipment that are:
    - a. New
    - b. Quality meeting or exceeding specified standards.
    - c. Free of faults and defects.
    - d. Conforming to Contract Documents.

- e. Of size, make, type, and quality specified.
  - f. Suitable for the installation indicated.
  - g. Manufactured in accordance with NEMA, ANSI, UL, or other applicable standards.
  - h. Otherwise as specified in Division 01, General Requirements.
2. Equipment not meeting all requirements will not be acceptable, even though specified by name.
  3. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer.
    - a. Component parts of the entire system need not be products of same manufacturer.
  4. Basis of Design:
    - a. Consider the Basis of Design equipment scheduled or specified by performance or model number.
    - b. If other equipment is provided in lieu of the Basis of Design equipment, assume responsibility for all changes and costs which may be necessary to accommodate this equipment, including, but not limited to:
      - 1) Different sizes and locations for connections.
      - 2) Different dimensions.
      - 3) Different access requirements.
      - 4) Other differences.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. General:

1. Provide a complete properly operating system for each item of equipment specified.
2. Install materials in a neat and professional manner.
3. Comply with equipment manufacturer's written instructions, the best industry practices, and the Contract Documents.
4. Comply with latest published NECA Standard of Installation, and provide competent supervision.

#### B. Clarification:

1. Where there is a conflict among manufacturer's instruction, best practice, and the Documents, request clarification from the Architect prior to rough-in.
2. Architect's decision will be final.
3. Remove and correct work installed without clarification at no cost to the Owner.

- #### C. Existing concrete, block, or brick walls are considered not accessible and may require use of Surface Mounted Raceway (SMR) if existing concealed raceway and device boxes are not available for reuse or do not meet the intent of the design (i.e., proximity to egress path, point of use, etc.). Coordinate route and installation where SMR is required with the Architect/Engineer prior to rough-in. Responsible for reinstalling SMR routed without such prior approval to the Architect's satisfaction.

- D. Existing stud walls (wood or metal) with or without blocking with plaster, plasterboard, or paneling finish are considered accessible with accessible ceiling, attic, tunnel, or crawl space above, below, or adjacent. Remove, patch, and repair finished surface as required to conceal rough in for new device locations. If it is determined that a specific instance will not permit concealment of rough-in due to obstructions such as beams, headers, and other structural elements, prior approval before rough-in from the Architect is required.

### 3.2 INSTALLATION IN RATED CONSTRUCTION

- A. Install intumescent material around ducts, conduits, and other electrical elements penetrating rated construction.
- B. Comply with firestop materials manufacturer written instructions to prevent spread of smoke or fire through sleeves or block-outs penetrating rated fire barriers.
- C. Provide firestop materials specified in Division 07, and as follows:
  - 1. Capable of passing a 3-hour test per ASTM E-814 (UL 1479).
  - 2. Consisting of material capable of expanding nominally eight times when exposed to temperatures of 250 degrees F-350 degrees F.
  - 3. An alternate method utilizing intumescent materials in caulk or putty complying with Division 07, Thermal and Moisture Protection Section, "Through-Penetration Firestop Systems" may be used.

### 3.3 NOISE CONTROL

- A. Minimize transmission of noise between occupied spaces.
- B. Outlet Boxes:
  - 1. Do not install outlet boxes on opposite sides of partitions back to back.
  - 2. Do not use straight through outlet boxes, except where indicated.
- C. Conduit:
  - 1. Route conduit along corridors or other "noncritical" space to minimize penetrations through sound rated walls, or through non-sound-rated partitions between occupied spaces.
  - 2. Grout solid and airtight all penetrations through sound rated partitions.
  - 3. Use flexible connections or attachments between independent wall structures.
    - a. Do not rigidly connect (i.e., bridge) independent wall structures.
- D. Do not install contactors, transformers, starters, and similar noise-producing devices on walls that are common to occupied spaces, unless otherwise indicated.
  - 1. Where such devices are indicated to be mounted on walls common to occupied spaces, use shock mounts, or otherwise isolate them to prevent the transmission of noise to the occupied spaces.
- E. , contactors, starters, transformers, and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

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### 3.4 EQUIPMENT CONNECTIONS

#### A. General:

1. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices, and labor necessary for a finished working installation.
2. Verify the location and method for connecting to each item of equipment prior to roughing-in.
3. Check the amperage, maximum overcurrent protection, voltage, phase, and similar attributes of each item of equipment before rough in and connection.

#### B. Motor Connections:

1. Make motor connections for the proper direction of rotation.
2. Minimum Size Flex for Mechanical Equipment: 1/2-inch; except at small control devices where 3/8-inch flex may be used.
3. Exposed Motor Wiring: Jacketed metallic flex with minimum 6-inches slack loop.
4. Do not test run pump motors until liquid is in the system.

#### C. Control devices and wiring relating to the HVAC systems are furnished and installed under Division 23, HVAC; except for provisions or items indicated in Division 26, Electrical Drawings and Specifications.

### 3.5 EQUIPMENT SUPPORT

#### A. Minimum Support Capacity:

1. Provide fastening devices and supports for electrical equipment, luminaires, panels, outlets, and cabinets capable of supporting not less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure.

#### B. Luminaire Supports:

1. Support luminaires from the building structure.
2. Use supports that provide proper alignment and leveling of luminaires.
3. Where permitted at exposed luminaires, install flexible connections neat and straight, without excess slack, and attached to the support device.

#### C. Support all junction boxes, pull boxes, or other conduit terminating housings located above the suspended ceiling from the floor above, roof, or penthouse floor structure to prevent sagging or swaying.

#### D. Conduits:

1. Support suspended conduits 1-inch and larger from the overhead structural system with metal ring or trapeze hangers and threaded steel rod having a safety factor of four.
2. Conduits smaller than 1-inch installed in ceiling cavities, may be supported on the mechanical system supports when available space and support capacity has been coordinated with the subcontractor installing the supports.

3. Anchor conduit installed in poured concrete to the steel reinforcing with No. 14 black iron wire.
- E. Powder actuated or similar shot-in fastening devices will not be permitted for any electrical work except by special permission from the Architect.

### 3.6 ACCESS DOORS

- A. Location and size of access doors is Work of Division 26, Electrical.
- B. Furnishing and installation of access doors is work of Division 08, Openings.

### 3.7 ALIGNMENT

- A. Install panels, cabinets, and equipment level and plumb, parallel with structural building lines.
- B. Install distribution equipment and electrical enclosures fitted neatly, without gaps, openings, or distortion.
- C. Properly and neatly, close unused openings with approved devices.
- D. Fit surface panels, devices, and outlets with neat, appropriate, trims, plates, or covers without overhanging edges, protruding corners, or raw edges.

### 3.8 CUTTING AND PATCHING

- A. General:
  1. Comply with Division 01, General Requirements.
  2. Restore to original condition new or existing work cut or damaged by installation, testing, and removal of electrical Work.
  3. Patch and finish spaces around conduits passing through floors and walls to match the adjacent construction, including painting or other finishes.
  4. Clean up and remove all dirt and debris.
- B. Make additional required openings by drilling or cutting. Use of jackhammer is prohibited.
- C. Obtain Architect's permission and direction prior to piercing beams or columns.

### 3.9 PROTECTION OF WORK

- A. Protect electrical work and equipment installed under this Division against damage by other trades, weather conditions, or any other causes.
  1. Equipment found damaged or in other than new condition will be rejected as defective.
- B. Keep switchgear, transformers, panels, luminaires, and electrical equipment covered or closed to exclude dust, dirt, and splashes of plaster, cement, paint, or other construction material spray.
  1. Equipment not free of contamination is not acceptable.

- C. Provide enclosures and trims in new condition, free of rust, scratches, and other finish defects.
  - 1. If damaged, properly refinish in a manner acceptable to the Architect.

### 3.10 UNINTERRUPTED SERVICE

- A. Maintain electrical service to all functioning portions of the building throughout construction.
- B. Pre-arrange with Owner outages necessary for new construction.
  - 1. Comply with Division 01, General Requirements.
  - 2. Apply for scheduled shutdowns minimum 4 weeks prior to time needed and reconfirm a minimum of 72 hours prior to time needed.
  - 3. Contractor is liable for any damages resulting from unscheduled outages or for those not confined to the pre-arranged times. Damages include costs incurred by the Owner and by the Owner's tenants.
- C. Maintain signal and communication systems and equipment in operation at all times.
  - 1. Outages of these systems shall be treated the same as electrical power outages.

### 3.11 DEMOLITION AND SALVAGE

- A. General:
  - 1. Remove or relocate all electrical wiring, equipment, luminaires, etc., as may be encountered in removed or remodeled areas in the existing construction affected by this work.
  - 2. Disconnect electrical service to hard-wired equipment scheduled for removal under other Divisions of Work.
  - 3. Wiring which serves usable existing outlets restored and routed clear of the construction or demolition.
  - 4. Safely cut off and terminate wiring abandoned and removed to leave site clean.
- B. Reuse of Existing:
  - 1. Existing concealed conduits in good condition may be reused for installation of new wiring where available.
  - 2. Existing undamaged, properly supported surface conduits may be reused where surface conduits are called for, if the installation meets all workmanship requirements of the Specifications.
  - 3. Where new wiring is added or existing wiring disturbed in existing branch circuit raceways, existing wires replaced with new.
- C. Salvage and Disposal:
  - 1. Removed materials, not containing hazardous waste, not scheduled for reuse shall become the property of the Contractor for removal from the site, except for those items specifically indicated on the Demolition Drawings for salvage or reuse.
  - 2. Materials containing, or possibly containing, hazardous waste identified for removal and disposal by the Owner's Hazardous Waste Contractor.

3. Neatly store salvaged items at one location at the site where directed by the Owner's Representative.
4. Salvage properly operating circuit breakers from panels scheduled for removal and use to replace faulty or inadequate breakers in existing panels scheduled to remain.

### 3.12 COMPLETION AND TESTING

- A. General:
  1. Comply with Division 01, General Requirements.
- B. Upon completion, test systems to show that installed equipment operates as designed and specified, free of faults and unintentional grounds.
  1. Schedule system tests so that several occur on the same day.
  2. Coordinate testing schedule with construction phasing.
  3. Conduct tests in the presence of the Architect or its representative.
  4. Notify Architect of tests 48 hours in advance.
- C. Engage a journeyman electrician with required tools to conduct equipment tests. Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.
- D. Perform tests per the requirements of each of the following systems:
  1. Low Voltage Distribution System
  2. Emergency Power System (Lighting Inverter)
  3. Fire Alarm System
  4. Lighting System
  5. Lighting Control System
- E. Provide a written record of performance tests and submit with operation and maintenance data.

### 3.13 COMMISSIONING

- A. Complete phases of work so the system, equipment, and components can be checked out, started, calibrated, operationally tested, adjusted, balanced, functionally tested, and otherwise commissioned. Complete systems, including subsystems, so they are fully functional.
- B. Perform commissioning of Electrical Systems.
  1. Unless specified otherwise in the technical sections, provide factory startup services for the following items of equipment:
    - a. Lighting Control Systems
- C. Participation in Commissioning:
  1. Provide skilled technicians to checkout, startup, calibrate, and test systems, equipment, and components.



2. The Engineer reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system.

D. Resolution of Deficiencies:

1. Complete corrective work in a timely fashion to permit timely completion of the commissioning process. Experimentation to render system performance permitted.

E. Verification and Documentation:

1. Once each test is performed, have the commissioning manager observe the physical responses of the system and compare them to the specified requirements to verify the test results.
2. Submit site observation reports for deficiencies in the system.
3. Record the result of individual checks or tests on the pre-approved checklist, test, and report form from the commissioning plan and submit results for review.

END OF SECTION

## SECTION 20 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTOR AND CABLES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Conductors - 600V
  - 2. Power Limited Wiring
  - 3. Connectors - 600V and Below

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 26, Grounding and Bonding for Electrical Systems
- D. Section 26 05 33, Raceways and Boxes for Electrical Systems
- E. Section 26 05 53, Identification for Electrical Systems
- F. Section 26 05 80, Electrical Testing

## 1.3 REFERENCED STANDARDS

- A. ASTM: American Society For Testing and Materials:
  - 1. ASTM B 3 Soft or Annealed Copper Wire
  - 2. ASTM B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
  - 3. ASTM B 33 Tinned Soft or Annealed Copper Wire for Electrical Purposes
- B. ICEA: Insulated Cable Engineers Association:
  - 1. S-95-658 Non-shielded 0-2 kV Cables
- C. IEEE: Institute of Electrical and Electronic Engineers:
  - 1. IEEE 383 Type Test of Class IE Electric Cables, Field Splices, and Connections
- D. UL: Underwriters Laboratories:
  - 1. UL 44 Rubber-Insulated Wires and Cables
  - 2. UL 83 Thermoplastic-Insulated Wires and Cables
  - 3. UL 1277 Type TC Power and Control Tray Cable

## 1.4 SUBMITTALS

- A. Submit product data for the following materials:
  - 1. Single conductor 600V power and control conductors.
  - 2. MC Cable

- B. Submittals of the following materials consist only of a listing of the manufacturer's name and the applicable catalog numbers of the items to be utilized.
  - 1. Connectors
  - 2. Branch Circuit Conductor Splices
  - 3. Splices with Compression Fitting and Heat-Shrinkable Insulator
- C. Submit cable test data per testing requirements of PART 3.

## 1.5 QUALITY ASSURANCE

- A. Copper Conductors. Indicated sizes considered minimum for ampacities and voltage drop requirements.
- B. Conductors for special systems as recommended by the equipment manufacturer except as noted.
- C. Deliver conductors to the job site in cartons, protective covers, or on reels.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Conductors - 600V:
  - 1. General
  - 2. Essex
  - 3. Southwire
  - 4. Or equivalent.
- B. Connectors - 600V and Below:
  - 1. Burndy
  - 2. Anderson
  - 3. Or equivalent.

### 2.2 CONDUCTORS – 600V

- A. Type:
  - 1. Copper: 12 AWG minimum size unless noted otherwise. 12 AWG and 10 AWG, solid or stranded, 8 AWG or larger, Class B concentric or compressed stranded.
  - 2. Aluminum: Not allowed.
  - 3. Conductors with continuous colored jackets are acceptable; refer to color-coding in PART 3.
  - 4. Conductors with manufacturers no lube continuous jacket coatings are acceptable.
- B. Insulation:
  - 1. THHN/THWN-2 for conductors 6 AWG and smaller.
  - 2. XHHW-2 for conductors 4 AWG and larger.

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### 2.3 POWER LIMITED WIRING

- A. Copper, stranded or solid as recommended by the system manufacturer.
- B. Insulation appropriate for the system and location used.

### 2.4 CONNECTORS – 600V AND BELOW

- A. Branch Circuit Conductor Splices:
  - 1. Live spring type, Scotchlok, Ideal Wire Nut, Buchanan B-Cap, or 3M Series 560 self-stripping type.
  - 2. Push in self-locking type connectors, WAGO.
- B. Cable Splices:
  - 1. Compression tool applied sleeves, Kearney, Burndy, or equivalent with 600V heat shrink insulation.
  - 2. Submit proposed splice location to the Engineer for review, except where indicated on the plans
- C. Terminator Lugs for Stranded Wire:
  - 1. 10 AWG Wire and Smaller: Spade flared, tool applied.
  - 2. 8 AWG Wire and Larger: Compression tool applied.
  - 3. Setscrew type terminator lugs furnished as an integral part of distribution equipment, switches and circuit breakers will be acceptable.

## PART 3 - EXECUTION

### 3.1 CONDUCTORS

- A. Pulling compounds may be used for pulling conductors. Clean residue from the conductors and raceway entrances after the pull is made.
- B. Pulleys or Blocks:
  - 1. Use for alignment of the conductors when pulling.
  - 2. Pulling in accordance with manufacturer's specifications regarding pulling tensions, bending radii of the cable, and compounds.
- C. Make up and insulate wiring promptly after installation of conductors. Do not pull wire in until bushings are installed and raceways terminations are completed. Do not pull wire into conduit embedded in concrete until after the concrete poured and forms stripped.
- D. Provide a dedicated neutral conductor with each branch circuit, do not use a shared neutral conductor between phases unless specifically requested or directed.
- E. For remodel work or where shared neutrals are used by equipment such as systems furniture, provide a breaker handle tie as required for the phases sharing the neutral conductor.

### 3.2 CONNECTORS

- A. Terminate control and special systems with a tool applied spade flared lug when terminating at a screw connection.

- B. Screw and bolt type connectors made up tight and retightened after an 8 hour period.
- C. Apply tool applied compression connectors per manufacturer's recommendations and physically checked for tightness.

### 3.3 COLOR CODING

- A. Color code secondary service, feeders, and branch circuit conductors. Phase color code to be consistent at feeder terminations, A-B-C left-to-right, A-B-C top-to-bottom, or A-B-C front-to-back. Color code is as follows:

120/240V 208Y/120V	Phase	480V 480Y/277V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray*
Green	Ground**	Green
* or white with colored (other than green) tracer		
**Ground for isolated ground receptacles green with yellow tracer.		

- B. Use solid color compound or solid color coating for 12 AWG and 10 AWG branch circuit conductors and neutral sizes.
- C. Phase conductors 8 AWG and larger color code using one of the following:
  1. Solid color compound or solid color coating.
  2. Stripes, bands, or hash marks of color specified above.
  3. Colored as specified using 3/4-inch wide tape. Apply tape in half overlapping turns for a minimum of three inches for terminal points and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Apply tags to cable stating size and insulation type where cable markings are tape covered.
- D. Switch legs, travelers, etc., consistent with the phases to which, connected or a color distinctive from that listed.
- E. Color-coding of the flexible wiring system conductors and connectors.
- F. For modifications and additions to existing wiring systems, color-coding conform to the existing wiring system.

### 3.4 FIELD TESTING

- A. 600V Rated Conductors: Test for continuity. Conductors 100A and over in meggered after installation and prior to termination. Provide the megger, rated 1,000V DC, and record and maintain the results, in tabular form, clearly identifying each conductor tested.
  1. Replace cables when test value is less than 1 megohms.
  2. Cable test submittal include results, equipment used, and date.

END OF SECTION

## SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Ground Conductors
  - 2. Connectors

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
- D. Section 26 05 33, Raceways and Boxes for Electrical Systems
- E. Section 26 24 16, Panelboards
- F. Section 26 27 26, Wiring Devices

## 1.3 QUALITY ASSURANCE

- A. Provide complete ground systems as indicated. Include conduit system, transformer housings, panelboards, motors, and miscellaneous grounds required.
- B. Provide an insulated ground conductor in every conduit or raceway containing power conductors.
- C. Continue existing system as specified herein and shown on the Drawings.

## PART 2 - PRODUCTS

## 2.1 GROUND CONDUCTORS

- A. Green insulated copper for use in conduits, raceways, and enclosures.

## 2.2 CONNECTORS

- A. Grounding lugs where provided as standard manufacturer's items on equipment.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Grounding Conductors: Sized in accordance with Article 250, Tables 250.66 and 250.122 of the National Electrical Code.
- B. Grounding Conductor Connectors: Make up tight, located for future servicing, and ensure low impedance.
- C. Plug-in Receptacles: Bonded to the boxes, raceways, and grounding conductor.

### 3.2 EQUIPMENT

- A. Provide separate green insulated equipment ground conductor in non-metallic and flexible electrical raceways.
- B. Ground luminaires, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, buses, etc., for this purpose.

END OF SECTION

## SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Hangers
  - 2. Pipe Straps
  - 3. Support of Open Cabling

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 33, Raceways and Boxes for Electrical Systems
- D. Section 26 24 16, Panelboards
- E. Section 26 50 00, Lighting

## 1.3 REFERENCED STANDARDS

- A. International Building Code (IBC)
- B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

## PART 2 - PRODUCTS

## 2.1 HANGERS

- A. Kindorf B-905-2A Channel, H-119-D washer, C105 strap, minimum 1/2-inch rod with ceiling flange, or equal.

## 2.2 PIPE STRAPS

- A. Two-hole galvanized or malleable iron.

## 2.3 SUPPORT OF OPEN CABLING

- A. Support of Open Cabling: Label NRTL for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
  - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
  - 2. Lacing bars, spools, J-hooks, and D-rings.
  - 3. Straps and other devices.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Provide electrical equipment supports.



- B. Install vertical support members for equipment, straight and parallel to building walls.
- C. Provide independent supports to structural member for electrical fixtures, materials, or equipment installed in or on ceiling, walls, or in void spaces and/or over furred or suspended ceilings.
- D. Do not use other trades' fastening devices to support electrical equipment materials or fixtures.
- E. Do not use supports and/or fastening devices to support other than one particular item.
- F. Support conduits within 18-inches of outlets, boxes, panels, cabinets, and deflections.

### 3.2 LUMINAIRES

- A. Light-Duty Ceiling Systems:
  - 1. Attach 12 gauge hanger wire from each corner of the luminaire to the structure above.
  - 2. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.
- B. Intermediate-Duty Ceiling Systems:
  - 1. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.
  - 2. Attach 12 gauge hanger wire within 3-inches of each corner of each luminaire.
  - 3. Connect two 12 gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.
  - 4. Support luminaries weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.
- C. Heavy-Duty Ceiling Systems:
  - 1. Positively and securely, attach luminaire within 6 inches of each corner to the suspended ceiling-framing member by mechanical means.
  - 2. Connect two 12-gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.
  - 3. Support luminaries weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.

### 3.3 PULL AND JUNCTION BOXES

- A. Pull and junction boxes installed within the cavity of a suspended ceiling that is not a fire rated assembly may be attached to the suspended ceiling framing members, provided the following criteria are met:
  - 1. Installation complies with the ceiling system manufacturer's instructions.
  - 2. Pull or junction box is not larger than 100 cubic inches.
  - 3. Support to the main runner with two fastening devices designed for framing member application and positively attach or lock to the member.
  - 4. Serves branch circuits and associated equipment in the area.

5. Pull or junction box is within 6-feet of the luminaires supplied.
6. Framing members are not rotated more than 2 degrees after installation.
7. Install within the cavity of a suspended ceiling may be attached to independent support wires, provided the following criteria are met:
  - a. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.
  - b. No larger than 100 cubic inches.
  - c. Secure to the independent support wires by two fastening devices designed for the application.
  - d. Independent support wires in a fire-rated ceiling are distinguishable by color, tagging, or other effective means.

### 3.4 CABLES AND RACEWAY

- A. Cables and raceway installed within the cavity of a suspended ceiling may be attached to independent support wires provided the following criteria are met:
  1. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.
  2. Raceways no larger than 1-inch trade size and cables and bundled cables are not larger than 1-inch diameter including insulation.
  3. Not more than three raceways or cables supported by independent support wire and supported within the top or bottom 12-inches.
  4. Cables for telecommunications, data processing, Class 2 power-limited signaling systems, fiber optics, and other power limited systems are securely fastened within 2 feet of each termination and at intervals not to exceed 5-feet or per the manufacturer's installation instructions.
  5. Secure raceways at intervals required for the type of raceway installed.
  6. Secure cables and raceway to independent support wires by fastening devices and clips designed for the purpose.
  7. Independent support wires are distinguishable by color, tagging, or other effective means.
- B. Cables and raceway installed within the cavity of a suspended ceiling may be supported with trapezes constructed of steel rods and channels provided the following criteria are met:
  1. The size of the rods, channel, and fastening devices are suitable for the anticipated weight.
  2. The spacing of the trapezes meets that required for the type of raceway installed.
  3. Secure to a trapeze by straps designed for the purpose.
  4. Cables and raceway do not support other raceway or cables.
  5. An appropriately sized seismic bracing system is installed.

END OF SECTION

## SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Metallic Conduits
  - 2. Wireways
  - 3. Fittings
  - 4. Metallic Boxes

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
- D. Section 26 05 26, Grounding and Bonding for Electrical Systems
- E. Section 26 05 29, Hangers and Supports for Electrical Systems
- F. Section 26 05 53, Identification for Electrical Systems

## PART 2 - PRODUCTS

## 2.1 GENERAL

- A. Raceways and conduits of specified types for electrical system wiring, except where clearly indicated otherwise.
- B. Fittings, boxes, hangers, and appurtenances required for the conduits and raceways.
- C. Size raceways and conduits as indicated. Where no size indicated, conduit may be the minimum code permitted size for the quantity of conductors installed, based upon NEC tables for conductors with type THW insulation.

## 2.2 METALLIC CONDUITS

- A. Electrical Metallic Tubing (EMT):
  - 1. Smooth surface, thin wall mild steel tube of uniform thickness and temper, galvanized or sherardized on the outside, and enameled on the interior.
  - 2. Comply with NEC Article 358.
- B. Flexible Conduits (Flex):
  - 1. Flexible Metallic Conduit:
    - a. Interlocking single strip steel construction, galvanized inside and out after fabrication.
    - b. Comply with NEC Article 348.

2. Liquid Tight:
  - a. Similar to flexible metallic conduit, except encased in a liquid tight polyvinylchloride or equivalent outer jacket over the flexible steel core.
  - b. Comply with NEC Article 350.

### 2.3 WIREWAYS

- A. Troughs: Steel, painted, square in cross section, preformed knockouts on standard spacing, screw cover.
- B. Fittings: Tees, elbows, couplings as required for configuration shown on the Drawings.
- C. EMT:
  1. Connectors:
    - a. Steel compression ring type for conduit termination, with insulated throat, suitable for conditions used.
    - b. Use lay-in grounding type bushings where terminating grounding conductors.
  2. Couplings: Steel compression ring, concrete tight.

### 2.4 METALLIC BOXES

- A. Flush and Concealed Outlet Boxes: Galvanized stamped steel with screw ears for device ring mounting, knock-out plugs, mounting holes, fixture studs if required, RACO or equivalent.
- B. Surface Outlet Boxes: Galvanized stamped steel same as above for use on ceilings; cast steel or aluminum with threaded hubs or bosses for use on walls.
- C. Large Boxes:
  1. Boxes exceeding 4-11/16-inches when required welded steel construction with screw cover and painted, steel gauge as required by physical size,
  2. Manufacturers:
    - a. Hoffman
    - b. Circle AW
    - c. Or equivalent.
- D. Systems:
  1. Boxes for systems devices as recommended by the systems manufacturer, suitable for the equipment installed.
  2. Equip with grounding lugs, brackets, device rings, etc., as required.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Conceal conduits in finished spaces. Concealed conduits run in a direct line with long sweep bends and offsets.
- B. Route exposed conduit parallel or at right angles to structural building lines and neatly offset into boxes. Conduits attached directly to building surfaces closely follow the surfaces. Conduit fittings used to saddle under beams. Drilling or notching of existing beams, trusses on structural members coordinated with Architect prior to commencing.

- C. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete, or foreign objects. Clean and dry raceways before installation of wire and at the time of acceptance.
- D. Pack spaces around conduits with polyethylene backing rods and seal with polyurethane caulking to prevent entrance of moisture where conduits are installed in sleeves or block-outs penetrating moisture barriers.

### 3.2 CONDUIT

- A. EMT:
  - 1. Use in other dry protected locations for circuits rated 600V and less.
  - 2. Securely support and fasten whether exposed or concealed at intervals of nominally every 8-feet and within 24-inches of each outlet, ell, fitting, panel, etc.
- B. Flex:
  - 1. Use for connections to vibration producing equipment and where installation flexibility is required with a minimum 12-inches slack connection.
  - 2. Limit flex length to 36-inches for exposed equipment connections and 72-inches in concealed ceiling and wall cavities.
  - 3. Use PVC jacketed flex in wet locations, areas subject to washdown, and exterior locations.

### 3.3 FITTINGS

- A. Assemble continuous and secured metallic raceways and conduits to boxes, panels, etc., with appropriate fittings to maintain electrical continuity. Cut square and reamed smooth conduit joints with fittings drawn up tight.

### 3.4 BOXES

- A. General:
  - 1. Outlet Boxes: Code required size to accommodate wires, fittings, and devices.
  - 2. Provide multi-gang boxes as required to accept devices installed with no more than one device per gang.
  - 3. Equip metallic boxes with grounding provisions.
- B. Size and Type:
  - 1. Flush wall switch and receptacle outlets used with conduit systems 4-inches square, 1-1/2-inches or deeper, with one or two-gang plaster ring, mounted vertically. Where three or more devices are at one location, use one piece multiple gang tile box or gang box with suitable device ring.
  - 2. Wall bracket and ceiling surface mounted luminaire outlets 4-inch octagon 1-1/2-inches deep with 3/8-inch fixture stud where required. Wall bracket outlets have single gang opening where required to accommodate luminaire canopy. Provide larger boxes or extension rings where quantity of wires installed requires more cubic capacity.

3. Junction boxes installed in accessible ceiling or wall cavities or exposed in utility areas minimum of 4-inches square, 1-1/2 inches deep with appropriately marked blank cover.
  4. Boxes for the special systems suitable for the equipment installed. Coordinate size and type with the system supplier.
- C. Pull Boxes:
1. Provide pull boxes where shown for installation of cable supports or where required to limit the number of bends in conduits to not more than three 90-degree bends.
  2. Use galvanized boxes of code-required size with removable covers installed so that covers will be accessible after work is completed.
- D. Installation:
1. Mount boxes and outlets at nominal centerline heights shown on the drawings.
  2. Recessed Boxes:
    - a. Flush with finished surfaces or not more than 1/8-inch back, level and plumb.
    - b. Long screws with spacers or shims for mounting devices will not be acceptable.
    - c. No combustible material exposed to wiring at outlets.
  3. Covers for flush mounted boxes in finished spaces extend a minimum of 1/4-inch beyond the box edge to provide a finished appearance. Finish edge of cover to match cover face.
  4. Boxes installed attached to a stud in sheet rock walls equipped with opposite side box supports equivalent to Caddy 760. Install drywall screw prior to finish taping. Methods used to attach boxes to studs not to cause projections on the face of the stud to prevent full-length contact of sheet rock to the stud face.

### 3.5 PULL WIRES

- A. Install nylon pull lines in empty conduits larger than 1-inch where routing includes 25-foot or more in length or includes 180 degrees or more in bends.
- B. Where conduits requiring pull lines are stubbed out and capped, coil a minimum of 36-inches of pull line and tape at termination of conduit for easy future access. Label pull lines as to conduit starting or terminations point and intended future use.

END OF SECTION

## SECTION 26 05 40 - SURFACE METALLIC RACEWAY FOR ELECTRICAL SYSTEM

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Raceways

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
- D. Section 26 05 26, Grounding and Bonding for Electrical Systems
- E. Section 26 05 53, Identification for Electrical Systems
- F. Section 26 27 26, Wiring Devices

## 1.3 SUBMITTALS

- A. Shop Drawing Submittals:
  - 1. Submit Shop Drawings of the complete system.
  - 2. Include sizes and lengths of raceways as verified with laboratory furniture Shop Drawings, end caps, raceway cover spacing's, grounding, branch circuiting and wiring including locations of service entrances, receptacle types and manufacturers, receptacle spacing, receptacle labeling with proper voltage, phase, circuit and panelboard designations as indicated on the drawings.
  - 3. Accompany at the same time of the submittal, by floor plans showing raceway locations, with each piece numbered the same as the corresponding number of the raceway piece number in the submittal.

## PART 2 - PRODUCTS

## 2.1 GENERAL

- A. Provide a complete surface metallic raceway system for standard receptacles to include receptacles, devices, supports, fittings, and accessories necessary to complete the installations indicated.

- B. In the event the Contractor chooses to furnish and install a system or item of equipment of different arrangement from the system herein specified, provide additional labor and material required by the system at no additional cost to the Owner, and obtain prior approval.
- C. Tests and operational check determine the suitability for energization.
- D. Schedule tests and give a minimum of one week's advance notice of time and date to the Architect and Owner for any major systems tests specified in this Section.

## 2.2 RACEWAYS

- A. Factory pre-assembled complete including bases, covers, end plates, wiring, receptacles, fittings and connections, to exact lengths to match the lengths of the cabinets and shelving as indicated on laboratory furniture Shop Drawings since the lengths shown on electrical drawings are illustrative and diagrammatic only and are not accurate, also see island bench details on the drawings.
- B. Receptacle circuits to be prewired for the entire length of the section, leaving 2-foot pigtail for field connection and properly tagged for circuit identification in field.
- C. Tap splicing of wires done using Scotchlok 562 self-stripping electrical tap connectors, or equivalent.
- D. Raceway base, cover and end plates to be constructed of extruded aluminum 6063-T5, 0.060 inch minimum wall thickness. Finish to be clear anodized AA-C22A31 Architectural Class II.
- E. Blank snap-in raceway covers to be precut to 12-inch sections. Each cover plate able to withstand 45 pound cord pull pressure. Regardless, raceway covers stay on when pulling off any receptacle plug. Support receptacles in the raceway from the raceway covers by countersunk screws, and independent of the raceway bases or main body. Covers to be provided with receptacles mounted and identified by means of engraved 3/16 inch black letters indicating receptacle voltage, phase, and amperage for receptacles other than the regular 20A, 120V receptacles (i.e., 208V, 1-phase, 30A) at top of receptacle. Receptacles have panel and circuit designation (i.e., LPA22) at bottom of receptacle. Dedicated 20A, 120V receptacles labeled DEDICATED at top of receptacles. Receptacles on optional standby circuits labeled as STANDBY.
- F. Where raceways are shown connected at right angles to each other, the end plate of the raceway overlapping the faceplate of the other raceway regressed flush with the ends of the raceway base/body.



## PART 3 - EXECUTION

## 3.1 GENERAL

- A. Raceways to be mounted on walls and casework parallel to or at right angles to structure and casework.
- B. The number of conductors installed in any raceway not greater than the number for which the raceway is approved.
- C. Ground continuity maintained throughout the entire raceway length by means of factory installed separate insulated Code-size grounding conductors. Each equipment grounding conductor in a conduit homerun entering the raceway connected to the ground terminals of the receptacles and to the ground stud in the raceway interior. Bonded receptacle cover plates.
- D. Each 20A, 120V circuit of an individual or multi-circuit wiring in a raceway provided with individual 12 AWG neutral conductor for each circuit.
- E. In multi-wire branch circuits, the continuity of a grounded conductor (neutral) not dependent upon device connections, such as receptacles, etc., where the removal of such devices would interrupt the continuity.
- F. At least 6-inches of free conductors left at each outlet, junction and switch point for splices or the connection of fixtures or devices.

END OF SECTION

**SECTION 26 05 45 - SEISMIC RESTRAINTS FOR ELECTRICAL RACEWAYS AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes:
  - 1. Seismic Bracing
  - 2. Channel Type Elements
  - 3. Bolting Accessories

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 29, Hangers and Supports for Electrical Systems

**1.3 REFERENCED STANDARDS**

- A. The following are the referenced standards:
  - 1. SMACNA      Sheet Metal and Air Conditioning Contractor's National Association
  - 2. AISC          American Institute of Steel Construction
  - 3. ASTM         American Society for Testing and Materials
  - 4. AWS           American Welding Society
  - 5. IBC           International Building Code
  - 6. ICC           International Code Council

**1.4 QUALITY ASSURANCE**

- A. General Requirements:
  - 1. Provide seismic restraints for equipment, both supported and suspended, and conduits.
  - 2. Bracing of conduits in accordance with the provisions set forth in the SMACNA seismic restraint manual.
  - 3. Review and approve structural requirements for restraints, including their attachment to the building structure by a registered structural engineer in the same state as the project.
  - 4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.
- B. Bracing of Conduits:
  - 1. Provide seismic bracing of conduit as detailed below:

- 
2. Exception: Conduits suspended by individual hangers 12-inches or less in length, as measured from the top of the conduit to the bottom of the support where the hanger is attached, need not be braced.
    - a. Brace electrical conduits 2-1/2 inch nominal diameter or larger.
    - b. Brace conduits located in electrical rooms, boiler rooms, mechanical equipment rooms, and refrigeration mechanical rooms that are 1-1/4-inch nominal diameter and larger.
  - C. Suspended Equipment and Raceways:
    1. Cable Method: The seismic restraint shall consist of a combination of stranded steel aircraft cable with an added nut and neoprene and steel washer.
    2. Cable attachment details, cable size, and the neoprene and steel washers shall be sized by the manufacturer and are to be indicated in the shop drawings.
    3. Provide detailed shop drawings for approval in sufficient time to allow structural attachment work to be incorporated into the normal work sequence.
  - D. Seismic restraints, including anchors to building structure, designed by a registered professional structural engineer licensed in the state of Oregon. Design includes:
    1. Number, size, capacity, and location of anchors for floor- or roof-mounted equipment. For curb-mounted equipment, provide design of attachment of both the unit to the curb and the curb to the structure. For units weighing greater than 2500 pounds, or curbs more than 10 feet long, provide substantiating calculations the curb can accept the prescribed seismic forces.
    2. Number, size, capacity, and location of seismic restraint devices and anchors for vibration-isolation and suspended equipment.
    3. Number, size, capacity, and location of braces and anchors for suspended raceways, bus ducts, and cable trays on as-built plan drawings.
      - a. Select a single seismic restraint system pre-designed to meet the requirements of the latest edition of the IBC such as the 1999 Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, and Electrical Systems.
      - b. Details or designs from separate seismic restraint guidelines are not acceptable. Installation not addressed by the selected system shall be designed, detailed, and submitted alone with the as-built plan drawings.
      - c. Maximum seismic loads shall be indicated on drawings at each brace location. Drawings shall bear the stamp and signature of the registered professional structural engineer licensed in the state of Oregon who designed the layout of the braces.
  - E. Supports, Hangers, and Anchors: Comply with the requirements of Section 26 05 29, Hangers and Supports for Electrical Systems, except anchor (expansion) bolts used for connection Level 3 have expansion anchor capacities equal to 50 percent of the ICC research report values.

## 1.5 SUBMITTALS

- A. Product Data: Submit product data for products specified herein.

- B. Shop Drawings:
1. Submit shop drawings complying with the requirements of the Quality Assurance article of this Section.
  2. Stamp shop drawings by a professional structural engineer licensed in the state of Oregon.
  3. Approve submittals prior to rack fabrication and installation.
- C. Calculations:
1. Submit seismic calculations indicating restraint loadings resulting from the design seismic forces presented in the Quality Assurance article of this Section.
  2. Include proper anchorage details and when applicable and include consideration of the types of concrete.
  3. Certify by a professional structural engineer licensed in the state of Oregon.
- D. Certifications:
1. Submit certification of seismic restraint's and building structural member's capability to safely accept loads resulting from seismic forces calculated in the previous paragraph.
  2. Tests in three planes clearly showing ultimate strength and appropriate safety factors performed by independent laboratories and certified by a professional structural engineer licensed in the state of Oregon or calculations by a professional structural engineer licensed in the state of Oregon are acceptable.

## PART 2 - PRODUCTS

### 2.1 SEISMIC BRACING:

- A. Steel fabrication, in accordance with AISC M011 Manual, with structural steel shapes of ASTM A 36 steel.
- B. Welding in accordance with AWS D1.1.
- C. Design and sizes as required.
- D. Fastenings, bracing, and assembly selected by a professional structural engineer licensed in the state of Oregon.

### 2.2 CHANNEL TYPE ELEMENTS

- A. 12 gauge formed steel, 1-5/8-inch square prime painted or chromate dip finish. Use spring-in nuts with grooves.

### 2.3 BOLTING ACCESSORIES

- A. Machine bolts with semi-finished nuts.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Provide support assemblies to meet the seismic zone indicated. Equipment shall be braced and anchored to conform to the requirements listed under the Quality Assurance article of this Section.
- B. Seismically brace raceways, cable trays, and suspended bus duct to conform to the requirements listed under the Quality Assurance article of this Section.
- C. Provide pipeline seismic flexible connectors where piping crosses building earthquake joints. Arrange raceways and connectors for the amount of motion required. Maintain continuity of the grounding system for each of the joints.
- D. Do not use powder-actuated inserts.
- E. Seismic Restraints:
  - 1. Attach to structural members of the building, which are capable of withstanding the design load of the seismic restraint.
  - 2. Ensure load capacity of the structural members is greater than or equal to the capacity of the seismic restraint.

END OF SECTION

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**SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes:
  - 1. Labels

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
- D. Section 26 05 33, Raceways and Boxes for Electrical Systems
- E. Section 26 09 23, Lighting Control Devices
- F. Section 26 09 33, Central Dimming Controls
- G. Section 26 24 16, Panelboards
- H. Section 26 27 26, Wiring Devices
- I. Section 26 50 00, Lighting
- J. Section 28 30 00, Fire Detection and Alarm

**PART 2 - PRODUCTS****2.1 LABELS**

- A. Pre-printed:
  - 1. Permanent material pre-printed with black on white, with adhesive backing.
  - 2. Manufacturer:
    - a. Brady
    - b. 3M
    - c. Or equal.
- B. Engraved Laminated Plastic:
  - 1. 3-ply laminated plastic, colors indicated herein, with beveled edges, engraved letters, and stainless steel screw attachment.
  - 2. Nameplate length to suit engraving.
  - 3. Adhesive attachment is not acceptable.
- C. Clear Plastic Tape:
  - 1. Black (normal) or red (emergency or standby) 12 point Helvetica medium text, clear adhesive backing, field printed with proper equipment for device labeling.
  - 2. Manufacturers:
    - a. Brother P-Touch

- b. Dyno-tape
  - c. Kroy
  - d. Or equal.
- D. Wire Markers:
- 1. White with black numbers, adhesive-backed tape on dispenser roll.
  - 2. Manufacturers:
    - a. Brady
    - b. 3M
    - c. Or equal.
- E. Feeder Conduit Marking:
- 1. Provide one-piece snap-around vinyl feeder conduit markers for feeder conduits.
  - 2. Provide custom label, black letters on orange background indicating destination equipment, 1-1/4-inch high letters (minimum) – Seton Setmark Pipe Marker Series.
  - 3. Provide additional one-piece snap-around vinyl label, black letters on orange background for voltage designation (i.e., 277/480V, 120/208V).
  - 4. Secure labels to conduits using plastic tie wrap, two per label.
- F. Marker Pen: Black permanent marker suitable for writing on metallic surfaces.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Nameplate and text coloring:
- 1. Normal        Black nameplate with white lettering.
  - 2. Emergency    Orange nameplate with black lettering.
  - 3. Standby       Yellow nameplate with black lettering.
  - 4. UPS            Blue nameplate with white lettering.

### 3.2 DISTRIBUTION TRANSFORMERS

- A. Provide engraved laminated plastic nameplate on the face of the equipment enclosure as follows:
- 1. Line 1: Equipment identification (e.g., T-N2P). Text height: 3/4-inch.
  - 2. Line 2: Equipment kVA rating, primary and secondary voltages (e.g., 150kVA, PRI: 480V, SEC: 208Y/120V). Text height: 1/2-inch.
- B. Provide additional engraved laminated plastic nameplate to indicate upstream source and location of upstream source as follows:
- 1. Line 1: Upstream source equipment (e.g., FED FROM MDP). Text height: 3/8-inch.
  - 2. Line 2: Location of upstream source (e.g., MAIN ELEC ROOM 102). Text height: 3/8-inch

3. Confirm final room designations with Architect and Owner prior to procurement of nameplates.

### 3.3 BRANCH CIRCUIT PANELBOARDS

- A. Provide engraved laminated plastic nameplate on the face of each panelboard centered above the door as follows:
  1. Line 1:
    - a. Equipment identification (e.g., PANEL 4HA).
    - b. Text height: 1/2-inch.
  2. Line 2:
    - a. Equipment voltage, phase, and wire quantity (e.g., 480Y/277V, 3PH, 4W).
    - b. Text height: 3/8-inch.
- B. Indicate feeder source, feeder wire size, and feeder breaker or fuse size with plastic tape labels on the inside of the panel door.
- C. Provide typewritten panel directories, with protective, clear transparent covers, accurately accounting for every breaker installed including spares.
  1. Schedules use the actual room designations assigned by name or number near completion of the work and not the space designation on the Drawings. Confirm final room designations with Architect and Owner prior to completion of work.
  2. Each load description includes a room or area designation whether indicated on the Drawings or not.

### 3.4 EQUIPMENT

- A. Provide engraved laminated plastic nameplate on the face of disconnect switches, motor starters, relays, contactors, and etc., indicating equipment served (e.g., AHU-1) and equipment load (e.g., 20 hp). Provide additional engraved laminated plastic nameplate indicating serving panel designation and circuit number.
- B. Provide clear plastic tape label for relays, contactors, time switches, and miscellaneous equipment provided under this Division of work indicating equipment served.

### 3.5 FEEDER CONDUIT

- A. Provide feeder conduit marker for electrical feeders.
- B. Provide markers when exiting source equipment and located along the entire conduit length 20-feet on centers in exposed areas, above ceilings, and upon entering or leaving an area or room.

### 3.6 DEVICES

- A. Label each receptacle plate with preprinted clear plastic tape indicating serving panel and circuit number (e.g., PANEL 2PA-5). Clean oils, dirt, and foreign materials from plate prior to label application. Label receptacles connected to a GFCI protected circuit downstream from the protecting device.



### 3.7 RACEWAYS AND BOXES

- A. Label pull boxes and junction boxes for systems with paint or marker pen on box cover identifying system. Where box covers are exposed in finished areas, label inside of cover.
- B. Color label covers as follows:
  - 1. 480Y/277V wiring                      Orange
  - 2. 208Y/120V wiring                      Black
  - 3. Fire Alarm                              Red
  - 4. Communications                      Green
  - 5. Security                                Blue
- C. Label each end of pull wires left in empty conduits with tags or tape indicating location of other end of wire.

### 3.8 SYSTEMS

- A. Complex control circuits may utilize combination of colors with each conductor identified throughout using wraparound numbers or letters. Use the number or letters shown where the Drawings or operation and maintenance data indicate wiring identification.
- B. Label the fire alarm and communication equipment zones, controls, indicators, etc., with machine-printed labels or indicators appropriate for the equipment installed as supplied or recommended by the equipment manufacturer.

### 3.9 EXISTING EQUIPMENT

- A. Provide new nameplates and labels for existing distribution equipment in accordance with panel descriptions shown on the Drawings. Provide new labels for feeder devices where labels are non-existent, incorrect, or confusing on existing distribution panels affected by this work.
- B. Equip existing branch circuit panelboards scheduled to remain with new, accurate, typed, circuit directories where circuiting changes are made.

END OF SECTION

## SECTION 26 09 23 - LIGHTING CONTROL DEVICES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Control Stations
  - 2. Standalone Room Controllers
  - 3. Occupancy/Vacancy Sensors
  - 4. Photosensor
  - 5. Relays, Switchpacks, and Room Controllers
  - 6. Power Supplies and Transformers
  - 7. Emergency Lighting Control Relays
  - 8. Low Voltage Control Wiring
  - 9. Test Equipment
- B. Responsibilities and participation under Division 26, Electrical in the automatic dimming system installation and commissioning process.
- C. Installation, connection, adjustment, and testing of the equipment including labor, materials, tools appliances, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational lighting control system

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 09 33, Central Dimming Controls
- D. Section 26 09 93, Sequence of Operations for Lighting Controls
- E. Section 26 27 26, Wiring Devices
- F. Section 26 50 00, Lighting

## 1.3 GENERAL REQUIREMENTS

- A. Provide qualified personnel for participation in commissioning tests, including seasonal testing required after the initial commissioning.
- B. Providing equipment, materials, and labor necessary to correct deficiencies found during the commission process which fulfill contract and warranty requirements.
- C. Provide Operating and Maintenance Data and Record Drawings to the Test Engineer for verification, organization, and distribution.
- D. Provide assistance to the Test Engineer to develop and edit descriptions of system operation.

- E. Providing training for the systems specified in this Division with coordination by the Test Engineer and Commissioning Agent.

#### 1.4 SUBMITTALS

- A. Shop drawings:
  - 1. Submittal drawings with a complete system diagram to show quantity of devices, location in the building, dimensions and required wiring.
  - 2. Occupancy sensors, show the required quantity to cover the space controlled (note: this may be more than the quantity shown on the drawings).
  - 3. The locations shown on the drawings are for reference only and coordinated with the manufacturer and Architect for final quantity and location during the bid process to allow for allowance of proper quantity, wiring lengths and installation coordination)
  - 4. Provide physical samples of user interface devices and visually exposed control devices for approval by Owner and Architect.
- B. Product data with wiring schematics for system and user interface components
- C. Installation and Record Drawings
- D. Operation and Maintenance Manuals:
  - 1. Include product data of system components, one line diagrams of installed components and their locations throughout the building, a final floor plan noting the locations of devices installed above ceilings, behind access panels or in concealed but accessible spaces and the lighting zones or devices they control.
  - 2. Final relay schedule with the zone of control, location of control zone, voltage, power feed, time clock setting, photocell set point, switch, or dimmer stations controlling the relay, and sweep function set points will be provided by the contractor.

#### 1.5 DEFINITIONS

- A. BACNET Protocol for integration with BAS/BMS/EMS
- B. BAS / BMS / EMS Building Automated System, Building Management System, Energy Management System
- C. CS Control Station
- D. D Dimming Wall Switch
- E. DT Dual Technology (PIR + U)
- F. FC Footcandles, metric for measuring light levels / illuminance levels
- G. GUI Graphic User Interface
- H. LCP Lighting Control Panel
- I. LED Light Emitting Diode
- J. LonWorks Protocol for integration with BAS/BMS/EMS

- K. OS/VS                      Occupancy Sensor / Vacancy Sensor,
  - 1. Occupancy sensors provide automatic on and automatic shut-off.
  - 2. Vacancy sensors provide automatic shut-off only, and require manual-on.
- L. PC                              Photocell
- M. PIR                             Passive Infrared Technology
- N. RS                              RS-232 Connection for AV Integration
- O. TC                              Timeclock, or astronomical timeclock
- P. U                                Ultrasonic Technology
- Q. WS                              Wall Switch
- R. WS/O                        Wallbox Occupancy Sensor Switch
  - 1. Wall Switch with integrated Occupancy Sensor

## 1.6 SYSTEM DESCRIPTION

- A. Control Stations:
  - 1. Control Station Types:
    - a. Provide control stations for occupant lighting control as scheduled on the drawings and may include and/or combine the following type of individual control type within a single station:
      - 1) Scene Selection
      - 2) On/Off Switching
      - 3) Dimming Raise/Lower
      - 4) Occupancy/Vacancy Sensor
- B. Relays, Switchpacks, and Room Controllers:
  - 1. Analog and Digital: Room controller devices to accept line voltage input as well as input from any combination of control stations, occupancy/vacancy sensors and/or daylight sensors and produce the required effect (switching or dimming) on up to four zones of connected lighting.
- C. Occupancy/Vacancy Sensing:
  - 1. Reduce electric energy consumption by reducing or eliminating lighting energy use in unoccupied spaces by switching lighting off with occupancy and/or vacancy sensors.
- D. Emergency Override: Provide automatic load control relay devices for controlling egress lighting circuiting.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design Manufacturer:
  - 1. Wattstopper
- B. Approved Basis of Design Alternate Manufacturers:
  - 1. Cooper Controls

2. Wattstopper
  3. Lutron
  4. Acuity Controls (nLight, LC&D, Sensor Switch)
  5. PLC Multipoint
  6. Encelium
- C. Products described in this section are to be provided by the single BOD (basis of design), or approved alternate, manufacturer, listed above, or by a compatible, BOD approved third party alternate manufacturer.
1. Manufacturer series numbers are identified herein to establish the minimum level of quality for each product.
  2. Comparable products that meet the requirements of the specification by other acceptable manufacturers identified herein are acceptable with prior approval.
  3. Other or equivalent Manufacturers and Products: Submit Substitution Request, complying with requirements of Division 00, Procurement and Contracting Requirements.

## 2.2 CONTROL STATIONS

- A. Control Station Types:
1. Scene Select: Provide four scene selection control station including discrete, engraveable pushbuttons allowing on/off and raise/lower control of entire space and means for occupants to select from four scenes indicated on drawings to be determined by owner.
  2. On/Off:
    - a. Rocker style switch for on and off control of zones indicated.
    - b. Controls lighting in entire space if no zones indicated on plans.
  3. Dimming/Raise Lower:
    - a. Provide individual pushbuttons for on and off control of zones indicated on plans.
    - b. Controls lighting in entire space if no zones indicated on plans.
    - c. Dimming accomplished by press and hold the ON and OFF buttons for dimming up and down respectively.
  4. Integral Occupancy:
    - a. Automatically switches lighting on when occupant enters space.
    - b. Switches lights off after predetermined period of vacancy.
    - c. Controls lighting in entire space.
  5. Integral Vacancy:
    - a. Includes pushbuttons for occupant manual on/off and dimming control of lighting in space.
    - b. Automatically switches lights off after predetermined period of vacancy.
    - c. Includes provision to revert to occupancy control in absence of configurable amount of daylight.
    - d. Controls lighting in entire space.

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- B. Line Voltage Dimming Switches:
1. Architectural grade, line voltage, 20A rated, single pole, preset style, slide up to brighten and down to dim, with on/off rocker style switch, decora style, wattage rating and lamp/power supply compatibility as required.
  2. Forward Phase, Reverse Phase, 0-10V.
  3. Provide 3-way type where shown on plan.
  4. Lutron Diva Series
- C. Wallbox Occupancy Sensor Switches:
1. 180 degree coverage, type as shown on plan (PIR, ultrasonic or dual-technology), configurable automatic-on or manual on operation, 3-wire type, daylight override, adjustable time-out, selectable walk-through mode and override off switch. Single or dual relay type as required or as shown on Drawings.
  2. Provide 3-way type where shown on plan.
  3. WattStopper PW series.
- D. Digital Control Stations:
1. Provide control stations with configuration as indicated or as required to control the loads as indicated.
  2. General Requirements:
    - a. Power: Class 2 (low voltage).
    - b. UL listed.
    - c. Provide faceplates with concealed mounting hardware, with matching finish.
    - d. Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning. Self-Adhesive labels not permitted.
    - e. Finish: As specified for wall controls in this Section.
  3. Single-Zone or Single-Group:
    - a. Turn an individual fixture or group of fixtures as shown on plans on and off via button press.
    - b. Raise and lower light levels via press and hold button.
      - 1) Separate buttons for dimming and on/off functions not allowed.
  4. Multi-Scene or Multi-Group:
    - a. General Requirements:
      - 1) Allows control of any devices part of the lighting control system as indicated on plans.
      - 2) Controls can be programmed with different functionality through system software without any hardware changes. Allows contextual functions based upon button press and press and hold input.
      - 3) Allows for easy reprogramming without hardware replacement.
      - 4) System will automatically update programming without direct human interaction upon replacement of any component.
      - 5) Communications: Utilize RS485 or similar wiring for low-voltage communication.

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- 6) To help occupants understand how to use the lighting control system, engraving requirements should be included for controls. Engraving details should include text size and style.
  - 7) Engrave keypads with button, zone, and scene descriptions as indicated on the drawings.
  - 8) Software Configuration:
    - a) Single defined action.
    - b) Buttons can be programmed to perform defined action on press and defined action on release.
    - c) Buttons can be programmed using conditional logic off of a state variable such as time of day or partition status.
    - d) Buttons can be programmed to perform automatic sequence of defined actions.
    - e) Capable of deactivating select keypads to prevent accidental and/or unwanted changes to light levels and other settings.
    - f) Buttons can be programmed for raise/lower of defined loads.
    - g) Buttons can be programmed to toggle defined set of loads on/off.
  - 9) Status LEDs:
    - a) Upon button press, LEDs to immediately illuminate.
    - b) Time delays inherent in large systems can cause short delays between button press and system confirmation. To avoid any confusion and prevent multiple button presses, keypads should immediately show that the button has been pressed for visual confirmation.
    - c) LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.
    - d) Support logic that defines when LED is illuminated:
      - (1) Scene logic (logic is true when zones are at defined levels).
      - (2) Room logic (logic is true when at least one zone is on).
      - (3) Pathway logic (logic is true when at least one zone is on).
      - (4) Last scene (logic is true when spaces are in defined scenes).
- b. Wired Keypads:
- 1) Style:
    - a) Mounting: Wall box or low-voltage mounting bracket; provide wall plates with concealed mounting hardware.
  - 2) Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.
  - 3) Terminal block/connector inputs to be over-voltage and miswire-protected against wire reversals and shorts.
  - 4) LEDs next to each button are used during programming and provide feedback when the buttons are pressed.
  - 5) Available with status LEDs.
  - 6) Available in several button configurations and finishes.
  - 7) Four Scene Control:
    - a) On, four scenes, and off with master raise/lower.

- b) Four LEDs for night light and secondary color to indicate programming mode.
  - (1) Recall four scenes plus on or off for one group of fixtures.
  - (2) Master raise/lower control for entire group of fixtures.
  - (3) Immediate local LED response upon button activation to indicate that a system command has been requested.

## 2.3 STANDALONE ROOM CONTROLLERS

### A. General:

1. Provides a common, standalone interface via dimming and/or switching to a group of 0-10V Dimming or Fixed Output Ballasts and/or 0-10V LED Drivers.
2. Direct conduit connection or provision for mounting to junction box.
3. Physical barriers provided between Class 1 and Class 2 wiring as well as between normal power and emergency power wiring.
4. Dual voltage 120/277V, 60HZ operation, 20A rating for each relay Relays utilize zero crossing technology for increased life.
5. Plenum Rated.

### B. Digital Room Controllers and Switchpacks:

1. Replacement of any component requires no reconfiguration or reprogramming.
2. Low voltage connections via CAT5/6 and RJ-45 connectors.
3. On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors and control stations.
4. Up to four on-board relays and accompanying 0-10V dimming channels.
5. Provision for IR or RF remote for configuration and editing of connected device settings.
  - a. Provide means to copy settings from on system to another.
6. Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol. Daylight harvesting feature for any number of zones.
7. Room Controller: WattStopper LMRC Series
8. Switchpack: WattStopper LMZC Series

### C. Analog Room Controllers and Power Packs:

1. On board power supply for a minimum of six accessory devices including, but not limited to occupancy sensors.
2. Up to four on-board relays and accompanying 0-10V dimming channels.
3. Provision for IR or RF remote for configuration and editing of connected device settings.
  - a. Provide means to copy settings from on system to another.
4. Field configurable to support, occupancy (automatic on) and vacancy (manual on) control protocol with optional daylight harvesting feature.



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## 2.4 OCCUPANCY/VACANCY SENSORS

### A. General Requirements:

1. Power Failure Memory: Settings and learned parameters to be saved in non-volatile memory and not lost should power be interrupted and subsequently restored.
2. Furnished with necessary mounting hardware and instructions.
3. NEC Class 1 or 2 devices, refer to plans.
4. Ceiling-Mounted Sensors: Indicate viewing directions on mounting bracket.
5. Wall-Mounted Sensors: Provide swivel-mount base.
6. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
7. Isolated Relay: Provide ceiling mounted sensors with an internal isolated relay with Normally Open, Normally Closed, and Common outputs rated at 1A at 30VDC/VAC for use with HVAC control, Data Logging and other control options.
8. Line Voltage sensors accept line voltage input and output switched line voltage directly to controlled luminaires.
  - a. Line voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by onboard device settings.
  - b. Sensor configuration to be made by integral pushbutton or dial controls.
  - c. Types:
    - 1) PIR: utilize invisible light to determine occupancy.
    - 2) Ultrasonic/Microphonic: utilize audible or subaudible sound to determine occupancy.
    - 3) Dual-Tech: utilize a combination of the above technologies to determine occupancy.
      - a) Detection of vacancy by both ultrasonic and PIR sensors required to turn lights off.
9. Low Voltage sensors are paired with a switch pack or room controller. Provide sensors compatible with room controller/switchpack and balance of system.
  - a. Low voltage sensors must be capable of occupancy or vacancy control. Operation is to be determined by overall system configuration and/or device settings.
  - b. Sensor configuration to be made by IR or wireless handheld configuration tool.
  - c. Types:
    - 1) PIR: utilize invisible light to determine occupancy.
    - 2) Ultrasonic/Microphonic: Utilize audible or sub-audible sound to determine occupancy.
    - 3) Dual-Tech: Utilize a combination of the above technologies to determine occupancy.
      - a) Detection of vacancy by both ultrasonic and PIR sensors required to turn lights off.

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- B. Ceiling Mounted: 360 degree coverage:
1. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode.
  2. Low- or line-voltage as shown on Drawings or described in Section 26 09 93, Sequence of Operations for Lighting Controls,
  3. Surface mounted, provide power packs as required.
    - a. Dual Technology Type:
      - 1) Low Voltage: WattStopper DT-300 Series.
      - 2) Line Voltage: WattStopper DT-355 Series
- C. Ceiling/Wall Mounted/Corner: 180 degree coverage:
1. Automatic-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode,
  2. Low-voltage with power pack, surface mounted as required.
    - a. Dual Technology type: WattStopper DT-200 series.
    - b. Passive infrared type: WattStopper CX-100 series.
- D. Provide multiple contacts and/or power packs for Low Voltage occupancy sensors that:
1. Control both normal and emergency lighting and require separation of branch circuit wiring systems. In case of occupancy sensor failure, emergency lighting fail to the on state.
  2. Control separate lighting control zones. Unless otherwise noted, occupancy sensors are intended to control light in a designated zone or room. Contractor is responsible for providing the required power packs to insure functionality of the system.
  3. Provide UL924 listed relay or power pack for to bypass occupancy sensors in event of power failure. During normal operation, relay to operate lighting in conjunction with adjacent normal power lighting.
- E. High Ceiling Occupancy Sensor:
1. Provide low or line voltage occupancy sensors where shown on plans.
  2. Automatic-on or manual-on operation, light-level sensing, adjustable time-out, automatic sensing/adjustment for optimal time-out delay setting, selectable walk-through mode.
  3. Suitable for mounting heights from 12-feet-40-feet.
  4. Surface mounted, provide auxiliary contacts if required.
    - a. Passive infrared type: WattStopper HB Series

## 2.5 RELAYS, SWITCHPACKS AND ROOM CONTROLLERS

- A. Analog:
1. Devices interconnected via low voltage cabling.

2. Configurable to produce the following sequences of operation by handheld IR or RF remote.
  - a. Occupancy control: Automatically turns lights on when occupant is detected in space. Automatically turns lights off after a configurable period of vacancy.
  - b. Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
  - c. Timeclock
  - d. Daylight Harvesting:
    - 1) Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
    - 2) Accepts input from analog daylight sensing equipment and adjusts light level settings accordingly.

B. Digital:

1. Devices interconnected by factory pre-terminated CAT5e/CAT6 Cabling.
2. Configurable to produce the following sequences of operation by handheld IR or RF remote.
  - a. Occupancy Control:
    - 1) Automatically turns lights on when occupant is detected in space.
    - 2) Automatically turns lights off after a configurable period of vacancy.
  - b. Vacancy Control: Occupant must manually turn lights in space on, automatically turns lights off after a configurable period of vacancy.
  - c. Timeclock
  - d. Daylight Harvesting
    - 1) Occupant must manually turn lights in space on, automatically turns lights off after a set period of vacancy.
    - 2) Accepts input from daylight sensing equipment and adjusts light level settings accordingly.
3. Provides additional capability or accessories to integrate with AV, BAS, HVAC, and/or shade control systems.

## 2.6 POWER SUPPLIES AND TRANSFORMERS

- A. Provide from same manufacturer of equipment served.
- B. Compatible with specified photocells and dimming control station protocols.
- C. Refer to Section 26 50 00, Lighting, for product specification on luminaire power supplies and transformers.

## 2.7 EMERGENCY LIGHTING CONTROL RELAYS

- A. Manufacturers:
  1. Bodine
  2. Nine 24
  3. Wattstopper
  4. Or approved equivalent.

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**B. General Requirements**

1. Comply with UL924 requirements:
  - a. If controlled off, must turn on automatically.
  - b. Provide required egress illuminance along entire egress path.
  - c. Must not be able to be overridden by building occupants.
2. Unless shown otherwise on drawings, load control relay provided is to control egress lighting along with adjacent normal power lighting except in event of power failure fire alarm system alarm status.
3. Device can be integral to other components listed above or operate in conjunction with other lighting control components as a discrete component, but must be fed via UL 1008 compliant power source, such that in event of a power failure, control and dimming signals are bypassed and lighting operates at full power. Fed via the UL 1008 source.

**C. Description:**

1. Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts.
2. UL924 listed for connected load of 10A at 277V or 120V.
3. UL rated N.C. contacts, minimum 10A rating.
4. Integral surge protection.
5. Two separate status emergency lighting indicators for troubleshooting:
  - a. Amber LED indicates presence of normal utility power.
  - b. Red LED indicates presence of unswitched emergency power.
6. Manual and/or automatic diagnostic testing feature.
7. Self-contained enclosure UL listed for installation in indoor or damp locations.

**2.8 LOW VOLTAGE CONTROL WIRING**

- A. 18 gauge shielded cable or as recommended by the manufacturer.

**2.9 TEST EQUIPMENT**

- A. Provide multi-function digital Illuminance meter with detachable receptor head with the following characteristics:
  1. Receptor: Silicon photocell type
  2. Illuminance Units: Lux or footcandles (switchable)
  3. Measuring range: 0.1 to 19,990 lux, 0.01 to 1,999 footcandles
  4. Accuracy:  $\pm 4$  percent  $\pm 1$  digit of displayed value
  5. Cosine Correction Characteristics: Within  $\pm 1$  percent at 10 degrees; within  $\pm 5$  percent at 60 degrees.
  6. Measuring functions: Illuminance, integrated illuminance, average illuminance.
  7. Temperature/humidity drift: Within  $\pm 3$  percent  $\pm 1$  digit (of value displayed at 68 degrees F) within operating temperature/humidity range.

8. Operating conditions: 32 degrees F to 104 degrees F) at less than 85 percent humidity.
- B. Provide proof of calibration within 12 months of use. Calibration performed by an independent calibration lab approved by the manufacturer of the meter.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Submittal data required prior to ordering and installation.
- B. General Testing:
  1. Functionally test control devices to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved drawings, specifications, and manufacturers installation instructions.
  2. Prepare and complete report of test procedures and results and file with the Owner.
  3. Install items per manufacturers written instructions.
- C. Control Stations:
  1. Control Stations to be combined wherever possible to minimize quantity of discrete gangs.
  2. Combine under common cover plates wherever shown together on plans.
- D. Low Voltage Wiring:
  1. Install in conduit where running through inaccessible areas. Provide plenum rated wiring in accessible ceiling spaces.
  2. Test CAT5/6 cables terminated on site prior to wiring of digital lighting control systems. Provide evidence of successful testing to engineer and owner. Factory pre-terminated cabling is not subject to this requirement.
  3. Coordinate low voltage wiring connection and location with luminaires to be controlled.
- E. Occupancy Sensors:
  1. For installation of low voltage occupancy sensors in inaccessible ceiling systems, coordinate power pack locations with Architect prior to installation [and provide access panels as required, coordinate access panel locations with Architect].
  2. Sensor locations identified on Drawings are diagrammatic and are meant to indicate only that occupancy sensing within a given space is required. Locate sensors as required by the manufacturer to provide maximum coverage of the room, to operate as someone enters the room, and to avoid false operation due to persons outside the room passing an open door.
    - a. Provide additional sensing heads as necessary or per manufacturer's recommendation to achieve complete coverage of each room.
  3. Set sensitivity as required to provide small movement coverage throughout the room without extending coverage beyond the room.

4. System performance testing done with the sensor timing set to the time delay indicated by space type in Section 26 09 93, Sequence of Operations for Lighting Controls.
  5. Upon Completion of installation and prior to turning space over to Owner, Contractor reset occupancy sensor automatic self-adjustment settings to insure proper time delay self-adjustment for Owner occupant schedule and room use.
  6. Allow for up to 24 hours of callback sensor adjustments to be made by the contractor or occupancy sensor manufacturer qualified installer for up to six months after the owner has taken occupancy of the space.
- F. Emergency Lighting Control Relays:
1. Provide unswitched emergency circuit, and unswitched and switched normal circuit to UL924 relay for control of emergency luminaires with remaining room luminaires on normal power.
  2. Install each relay within dedicated 4-11/16-inch junction box with double-gang plaster ring for wall or ceiling flush-mount or in a self-contained enclosure from the manufacture, as indicated on Drawings.
  3. Where location in ceiling would interfere with removal of ceiling tiles, install relay flush-mounted in nearest wall at ceiling level.
  4. Do not locate behind wall switch.

### 3.2 WORK PRIOR TO COMMISSIONING

- A. Complete phases of work so the system can be powered, tested, adjusted, and otherwise commissioned. Under Division 26, Electrical, complete systems, including subsystems, so they are fully functional. This includes the complete installation of equipment, materials, wire, controls, etc., in accordance with the contract documents and related directives, clarifications, change orders, etc.
- B. A commissioning plan will be developed by the Test Engineer and approved by the Commissioning Agent. Under Division 26, Electrical, assist the Test Engineer and Commissioning Agent in preparing the commissioning plan by providing necessary information pertaining to the actual equipment and installation. If system modifications and clarifications are in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner. If Contractor initiated system changes have been made that alter the commissioning process, the Commissioning Agent will notify the Owner.
- C. Specific pre-commissioning responsibilities under Division 26, Electrical are as follows:
  1. Factory startup services for the following items of equipment:
    - a. Lighting Control System
  2. Normal startup services required to bring each system into a fully operational state. This includes complete installation and cleaning. The Test Engineer will not begin the commissioning process until each system is documented as being installed complete.

- D. Begin commissioning after installation of interior and exterior finishes including but not limited to adjacent roofing, finished floor, wall, and ceiling systems including final painting, furniture and book stacks in place, and other building systems which have direct or indirect influence on the performance and distribution of the daylight and electric lighting systems.
- E. Start of commissioning before such items are complete will not relieve Contractor from completing those systems in accordance with the Construction Schedule.

### 3.3 SEQUENCE OF COMMISSIONING

- A. Provide to Architect prior to start of commissioning layout drawings indicating proposed location of measurement points. Proceed with commissioning after review and acceptance by Architect.
- B. Illuminance measurements oriented horizontal, facing up, at 30-inches above finished floor. Measurements for a control group occurs at the same location. Ensure constancy of local surface reflectance conditions throughout commissioning of each control group.
- C. Ensure no personnel or outside influence affects the amount of flux striking the receptor head during the recording session.
- D. Document measurements in clearly understandable format for review by the Architect. Include time of measurement, temperature, and relative humidity.
- E. Measure illuminance at least two hours after local sunset with full output of electric lighting. Record integrated illuminance and average illuminance for a 2 hour period.
- F. During daylight hours, measure illuminance with electric lighting off, including emergency and nightlight circuits. Record integrated illuminance and average illuminance for a two hour period. Document in clearly understandable format for review by the Architect.
- G. Set each photocell to 150 percent of electric-only lighting contribution.
- H. After initial setpoint has been set, measure illuminance in 10 minute increments from 1 hour before to 1 hour after local sunset.
- I. Submit recorded data to Architect for review.

### 3.4 TESTING FOR SEASONAL VARIATIONS

- A. Timing of Commissioning:
  - 1. Initial Commissioning:
    - a. Perform to best suit the current time-of-year and cloud cover conditions.
    - b. Conduct as done as soon as contract work is completed regardless of season.
  - 2. Seasonal Commissioning: Test under full sunlight and full overcast conditions during summer and winter solstice, as well as similar conditions at the spring or fall equinox.
  - 3. Subsequent Commissioning: Ascertain adequate performance during the four seasons.

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### 3.5 PARTICIPATION IN COMMISSIONING

- A. Provide skilled technicians to start up systems within Division 26, Electrical. The same technicians made available to assist the Test Engineer and Commissioning Agent in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested, and coordinated by the Test Engineer. Under Division 26, Electrical, ensure that the qualified technician(s) are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments, and problem resolutions at no additional cost to the Owner.
- B. System problems and discrepancies may require additional technician time, Test Engineer time, Commissioning Agent time, redesign, and reconstruction of systems and system components. The additional technician time made available for the subsequent commissioning periods until the required system performance is obtained at no additional cost to the Owner.
- C. Commissioning Agent reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service the commission the equipment, and a willingness to work with the Test Engineer and Commissioning Agent to get the job done. Remove technicians from the project at the request of either the Test Engineer or Commissioning Agent.

### 3.6 RESOLUTION OF DEFICIENCIES

- A. In some systems, misadjustments, misapplied equipment, and deficient performance will result in additional work required to commission the systems.
- B. Complete work under the direction of the Architect, with input from the Contractor, equipment supplier, Test Engineer, and Commissioning Agent.
- C. Whereas members will have input and the opportunity to discuss the work and resolve problems, the Architect will have final jurisdiction on the necessary work to be done to achieve performance.
- D. Complete corrective work in a timely fashion to permit timely completion of the commissioning process.
- E. Experimentation to render system performance is permitted. If the Commissioning Agent deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Agent will notify the Owner, indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities.
- F. If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services, equipment, or both, to resolve the problem.
- G. Costs incurred to solve the problems in an expeditious manner will be the Contractor's responsibility.

### 3.7 TRAINING

- A. Participate in the training of Owner's engineering and maintenance staff, as required in Divisions 01 through 28, on each system and related components.



- B. Conduct training in a classroom setting, with system and component documentation, and suitable classroom training aids.
- C. Training classroom sessions and file demonstrations will be videotaped and copies of this material will be provided as part of closeout requirements.
- D. Training will be conducted jointly by the test engineer, commissioning agent, the contractor, and the equipment suppliers.
- E. Test engineer responsible for highlighting system peculiarities specific to this project.

### 3.8 SYSTEMS DOCUMENTATION

- A. In addition to the requirements of Division 01, General Requirements, update contract documents to incorporate field changes and revisions to system designs to account for actual constructed configurations.
- B. Division 26, Electrical, record drawings include architectural floor plans and the individual daylight control systems in relation to actual building layout.
- C. Provide in AutoCAD .dwg format for transmittal to the test engineer.

END OF SECTION

## SECTION 26 09 33 - CENTRAL DIMMING CONTROLS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Dimmers and Control System
- B. Provide a complete and operable dimming control system as indicated.
- C. Include wiring, dimmers, dimmer cabinets, electronics, power supply, circuit breakers, low voltage (Class 2) control stations, A/V interface, emergency transfer and all other accessories required for system operation.
- D. Provide interface with building Lighting Control System and A/V systems.
- E. Include equipment and wiring necessary for proper system control and function.

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 27 26, Wiring Devices
- D. Section 26 50 00, Lighting

## 1.3 QUALITY ASSURANCE

- A. Install by an experienced contractor in the installation of dimming control systems. Provide a factory technician to supervise the startup and make final adjustment and tests of the system.
- B. Label and listed by Underwriters Laboratories, Inc. and Canadian Standards Association and shall be warranted for a period of one year after acceptance by the Owner.
- C. Supplier to furnish evidence of an experienced service organization which stocks system parts and is capable of providing repair service within one business day of notification.

## 1.4 SUBMITTALS

- A. Shop Drawings
- B. Product Data
- C. Installation and Record Drawings
- D. Operation and Maintenance Data

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Handling: Handle units carefully to prevent damage, denting and scoring. Do not install damaged units or components - replace with new.
- B. Storage: Store units in clean dry place. Protect from weather, dirt, and physical damage.

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## 1.6 DIMMING SYSTEM OPERATION

- A. Use modular component approach, utilizing dimmers, dimmers cabinets, plug-in electronics including power supply and circuit breakers.
- B. Standard catalog components shall available through electrical distributors.
- C. Install system capable of the following control functions:
  - 1. Preset, separate master raise/lowers for house lights, individual dimmer raise/lower, fade time adjustments (zero to five minutes) and off functions.
  - 2. Accept momentary dry contact closures from external sources to allow remote activation of presets and off functions.
  - 3. Blind Off preset will operate in the following manner: Dimming channels will dim to 10 percent within 2 seconds of receiving a dry contact closure from the building lighting control system. The channels will hold at 10 percent for a period of sixty seconds, and then switch off.
  - 4. Operate isolated presets by dry contact closures provided from the A/V system or by RS232 Serial port connection. The isolated presets will operate in the following manner: A signal from the A/V system will activate the scene. Four A/V presets will be provided.
  - 5. Control functions, stored dimmer intensity levels (presets) and label information shall be resident in the processor unit.
  - 6. Protect data including current operational status from power disruption by battery backup for a period of 30 days.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. ETC Inc.

### 2.2 DIMMERS AND CONTROL SYSTEM

- A. Main Control Station:
  - 1. Provide presets and control channels as indicated.
  - 2. Preset, master raise/lower for house lights, control channel raise/lower, fade time adjustments (zero to five minutes) and off functions shall be provided. Provide illuminated visual indication of lighting level at the channel control.
  - 3. Accept momentary dry contact closures from external sources to allow remote activation of presets and off functions.
  - 4. Control channel capable of non-dim operation.
  - 5. Attach faceplates to mounting frame without exposed screws or fasteners.
  - 6. Provide finish for stations as selected by the Architect from the following finishes:
    - a. White
    - b. Black
    - c. Ivory
    - d. Satin Aluminum
    - e. Polished Chrome

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- f. Polished Brass
  - 7. Engraved, silk-screened indicators for identification of lights controlled.
- B. Remote Control Stations:
- 1. Provide four scene presets and OFF and master raise/lower.
  - 2. One or two gang and match the finish and appearance of the master station.
  - 3. Connect to main control station with low voltage wiring as recommended by manufacturer.
  - 4. Provide finish for stations as selected by the Architect from the following finishes:
    - a. White, Black, Ivory, Satin Aluminum, Polished Chrome or Polished Brass.
    - b. Engraved, silk-screened or LCD indicators for identification of lights controlled.
- C. Dimming Cabinets:
- 1. NEMA grade steel cabinet(s) for surface or recessed mounting as shown on the drawings. Interior and exterior of all cabinets and doors shall be completely painted in enamel.
  - 2. Steel, hinged, locking door.
  - 3. Each cabinet to be factory pre-wired and include main lugs suitable for connecting to 3-phase/4-wire or single phase/ 3 wire power feeds at 120V. Separate feeds of appropriate type and voltage provided to each cabinet as shown on drawings.
  - 4. Cabinet not to exceed 32-inches wide by 18-inches deep by 48-inches high.
  - 5. Plug-in cabinet electronics to include:
    - a. Power supply.
    - b. Ability to assign power modules to control channels in the field. Each control channel shall be capable of controlling multiple power modules.
  - 6. Cabinets shall be ventilated, either fan cooled or convection cooled, and be designed to operate in a 104 degree F ambient operating temperature.
- D. Dimming Modules:
- 1. Capable of operating fluorescent, tungsten, or low-voltage loads. Digital firing circuits shall ensure that all dimmers set to the same intensity will track together.
  - 2. Use back to back silicon controlled rectifiers encapsulated into an insulated assembly providing ground fault isolation tested to 2500V RMS to provide symmetrical alternating current output to the load at any setting between 0 percent and 100 percent.
  - 3. Use toroidal filters to reduce RFI and lamp filament noise. Filtering shall be provided so that current rise time shall be at least 500 microsecond at actual load shown on load schedule as measured from 10 percent-90 percent of load current waveform at a 90 degree conduction angle, and at no point rise faster than 0mA/microsecond. Dimmers serving PAR lamps will be provided with toroidal filters to provide at least an 800 microsecond current rise time. Provide additional filtering as to reduce lamp filament noise. Toroidal filter for tungsten loads shall be sized for the load.

4. Each dimming module shall have an integral circuit breaker which may be used as a disconnect.
  5. Dimmer capable of withstanding a 50 percent overload for a period not exceeding 30 minutes without damage to the dimmer.
- E. A/V Interface:
1. Preset remote interface accepts dry contact closures or RS232 serial port signals from external source to provide on, off, access to presets.
  2. Preset remote interface shall provide a signal to the A/V system to provide preset status indication.
  3. House unit in a NEMA 1 steel enclosure with removable cover.

### PART 3 - EXECUTION

#### 3.1 DIMMING CONTROL SYSTEM

- A. Install system and connect lighting circuits per load schedule on drawings.
- B. Components for cabinets shall be factory installed. If cabinet enclosures are shipped prior to electrical, the rough-in enclosure shall be fabricated in such a way as to allow for the installation of a factory assembled subplate, consisting of the completed dimmer assembly, to be installed in the field by the contractor.
- C. Assembly and test system dimmers and controls at the factory as a complete system.
- D. Install cabinets plumb, square, and level.
- E. Install wiring in conduit.

#### 3.2 INSTRUCTION

- A. Without additional expense to the owner, competent authorized representative personnel give instructions for the care, adjustment, and operation of all parts of the system to the owner's representatives who are to have charge of the equipment.
- B. Each instructor thoroughly familiar with all parts of the installation and trained in operating theory as well as in practical operation and system maintenance.
- C. Furnish 4 hours of instruction by a qualified, factory trained technician after final acceptance of the system at the date and time selected by the Owner.
- D. Installation, startup and maintenance assistance available at no additional charge from the manufacturer on an as-needed basis.
- E. A toll-free technical assistance telephone line shall be provided by the manufacturer. Provide this number inside the cover of the dimming cabinet and on each dimming module.

#### 3.3 INSTALLATION AND RECORD DRAWINGS

- A. The Installation and Record Drawings called for under submittals consists of reproducible drawings with all outlets, devices, cabinets, conduits and wiring shown. Submit prints of drawings for approval prior to starting installation. Upon request, the Owner will furnish reproducible floor plans as required for the contractor's use in developing the Installation and Record Drawings.

- B. The contractor submitted drawings, when approved, will then form the basis for installation.
- C. At the completion of the work all deviations from the installation drawings incorporated on the reproduces to indicate record conditions. Submit drawings as Record Drawings for the system.

END OF SECTION

## SECTION 26 09 43 - NETWORK LIGHTING CONTROLS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Lighting Control Equipment

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Division 23, Heating, Ventilation, and Air Conditioning
- D. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
- E. Section 26 09 23, Lighting Control Devices
- F. Section 26 27 26, Wiring Devices
- G. Section 26 50 00, Lighting

## 1.3 QUALITY CONTROL

- A. Install by an experienced contractor in the installation of lighting control systems. Provide a factory technician to supervise the installation and installation and make final adjustment and tests of the system.
- B. Furnish evidence of an experienced service organization which stocks system parts and is capable of providing repair service within 24 hours.

## 1.4 SUBMITTALS

- A. Shop Drawings
- B. Product Data with Wiring Schematics
- C. Installation and Record Drawings
- D. Operation and Maintenance Manuals

## 1.5 SYSTEM OPERATION

- A. Use a modular component approach, utilizing a central processor, transceivers which activate relays and relay cabinets.
- B. Incorporate the following criteria:
  - 1. Control information from the controller to the transceiver multiplexed over Cat5E, Cat6A or a single, twisted pair of wires.
  - 2. Conform control wiring to NEC Article 725, Class 2.
  - 3. Components: Standard catalog items available through electrical distributors.
  - 4. Expandable to control up to 4,000 relays. Relays operable from 2 or 3-wire control systems.

5. Programmable on site to achieve control functions and be readily updatable to reflect changes without requiring rewiring.
- C. Installed system capable of the following control functions:
  1. Automatic Control: Areas to be activated in user dictated patterns (ON-OFF array of relays) according to either a weekly schedule broken into one-minute increments or alternate daily schedules pre-programmed for holidays.
  2. Manual Controls: Control relay or group of relays with either a maintained or momentary switch; activate group of relays to one of ten user determined patterns via a touchtone or pushbutton phone or the controller keyboard.
- D. Select, activate, and lock-in lighting pattern from the central controller with provisions to lock out manual and automatic commands.
- E. Indicate to the operator transceiver failure.
- F. Internal battery backup of ten hours for memory protection. Store program information on a disc and automatically reload the controller after a power outage longer than the battery backup.
- G. Capable of turning on circuits for continued operation should control component fail.
- H. A self-diagnostic routine to indicate a malfunction.

#### 1.6 CONNECTION TO EXISTING NETWORK

- A. General: Communication between peer-to-peer network lighting control panels via TCP/IP over existing Ethernet, RS-485, RS-232, or other previously established panel system communication protocol.
- B. Provide software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing system.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Wattstopper
- B. Lutron
- C. Acuity Controls (LC&D, nLight)
- D. Lutron
- E. Or approved.

#### 2.2 LIGHTING CONTROL EQUIPMENT

- A. Main Controller:
  1. Microcomputer pre-programmed for lighting control. Incorporate a 365-day clock and provide minute-by-minute control of the entire lighting system of up to 4,000 separate relays according to a pre-determined schedule.
  2. Accepts the lighting control schedule through a simple keyboard. In addition to the automatic schedule, control lighting circuit manually from the controller keyboard.



3. Provide monitoring of the system and display the ON/OFF state of each relay.
  4. Capable of driving a standard printer.
    - a. Include lighting control system operating software and current version of Windows operating system.
    - b. Include Trends and Relay Runtime Analysis software to allow the owner to analyze the operation of specific areas and identify those exceeding normal runtimes. Individual relays may be assigned a kWh weighted value or simply analyzed on a runtime basis. In both cases, the relays may be assigned to logical groups and plotted for the last 30 days or 12 months.
- B. Relay/Transceiver Cabinets:
1. Code gauge steel cabinets, surface, with cover and following interior devices.
    - a. 20A, 277V relays with 24V, 2 or 3 wire control, quantities as scheduled with space for 32 minimum.
    - b. 277V primary, 24V secondary control transformer.
    - c. Plug-in modular electronics to operate multiple relays as schedules, individually or in groups as directed by the controller.
    - d. Plug-in modular electronics for inputs which will notify the controller of change in input.
    - e. Terminals for system wiring.
    - f. Transceivers for input output control.
- C. Wire:
1. Data line, CAT5E, CAT6A or 18 AWG minimum size, shielded twisted pair, stranded copper, color coded, 300V minimum insulation. Twist wires every 3-inches or less.
  2. Wiring from low voltage switches or other controlling devices to the transceivers inputs and wiring from transceivers to remote mounted relays CAT5E, CAT6A or 18 AWG minimum, stranded copper, color coded, 300V minimum insulation. Multiconductor cable assembly may be used at contractor's option.
- D. Low Voltage Switch Modules:
1. Single:
    - a. Wattstopper LMSW series switches
    - b. Or approved.
- E. Photocells:
1. Accept indoor, skylight, and outdoor photosensing heads.
  2. Photosensing control permits the user to specify the actual footcandle level where desired switching occurs.
  3. An internal deadband timer exist to prevent the lights under photosensor control to toggle inadvertently as the sensor passes through the control threshold.

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## PART 3 - EXECUTION

### 3.1 DRAWINGS

- A. Installation and record drawings called for under submittals consists of reproducible drawings with outlets, devices, terminal cabinets, conduits and wiring shown. Prints of these drawings submitted for approval prior to starting installation. Upon request, the Architect will furnish reproducible floor plans as required for the contractor's use in developing the Installation and Record Drawings.
- B. Submit drawings when approved and form the basis for installation.
- C. Incorporate at the completion of the work deviations from the installation drawings on the reproducibles to indicate as built conditions. Submit drawings as Record Drawings for the system.

### 3.2 INSTALLATION

- A. Install systems for each section of each floor and connect lighting circuits per relay schedule on drawings.
- B. Area control switches able to manually provide 2-level control of lights by area.
- C. Provide conduit for all wiring, 1/2 inch minimum size.
- D. Components for cabinets factory installed.
- E. Install cabinets plumb, adjacent to serving lighting panel in electrical rooms as shown on the Drawings.

### 3.3 INSTRUCTION

- A. Without additional expense to the Owner, competent authorized representative personnel gives instruction for the care, adjustment, and operation of all parts of the system to the Owner's representative who is to have charge of the equipment.
- B. Each instructor thoroughly familiar with parts of the installation and trained in operating theory as well as in practical operation and system maintenance.
- C. Furnish 16 hours of instruction after final acceptance of the system at the dates and times selected by the Owner.
- D. Installation, start-up, and maintenance assistance available from the manufacturer on an as-needed basis.

END OF SECTION

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**SECTION 26 09 93 - SEQUENCE OF OPERATIONS FOR LIGHTING CONTROLS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes:
  - 1. Abbreviations and Definitions
  - 2. General Controls Approach
  - 3. Space-by-Space Sequence of Operations

**1.2 RELATED SECTIONS**

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 09 23, Lighting Control Devices
- D. Section 26 09 33, Central Dimming Controls
- E. Section 26 27 26, Wiring Devices
- F. Section 26 50 00, Lighting

**1.3 ABBREVIATIONS AND DEFINITIONS:**

- A. BACNET Protocol for integration with BAS/BMS/EMS
- B. BAS / BMS / EMS Building Automated System, Building Management System, Energy Management System
- C. D Dimming Wall Switch
- D. FC Footcandles. The metric for measuring light levels / illuminance levels
- E. GUI Graphic User Interface
- F. LCP Lighting Control Panel
- G. LonWorks Protocol for integration with BAS/BMS/EMS
- H. OS/VS Occupancy Sensor / Vacancy Sensor
  - 1. Occupancy sensors provide automatic on and automatic shut-off.
  - 2. Vacancy sensors provide automatic shut-off only, and require manual-on.
- I. PC Photocell
- J. RS RS-232 Connection for AV Integration
- K. SC Scene Control
- L. TC Timeclock, or astronomical timeclock
- M. WS Wall Switch

- N. WS/O Wallbox Occupancy Sensor Switch
1. Wall Switch with integrated Occupancy Sensor

#### 1.4 SYSTEM DESCRIPTIONS

A. General Controls Approach:

1. Fully Remodeled Interior lighting loads to be controlled via new, standalone lighting control infrastructure local to the space.
2. For Interior spaces with minor revisions extend existing lighting control circuits as required.
3. Specialty spaces will be provided with a central, rack-based DMX lighting control system for control over dynamic color and moving luminaires. Luminaires controlled via this system are denoted with 'Dxxx' tags and are scheduled on sheet E2.00.
4. Lighting control zones fed via new standalone lighting controls are identified on the drawing plans via 'Zxxx' along with the luminaire type designations, are scheduled on sheet E2.00.

B. Emergency Egress:

- a. Lights indicated as emergency to override to full output during power loss.
- b. Provide UL924 devices for emergency lights such that during normal power conditions the lights function (switch, dim by WS, dim by photocell, etc.) with the rest of the lights in the associated zone, and such that during emergency power conditions the lights override to full output.

C. Integration with AV Systems:

1. Provide interconnection between DMX control system and AV system in associated space such that a selection of (5) static and dynamic preset lighting control scenes are available at each AV control console.
2. Provide means of mapping room audio onto lighting channels to generate a dynamic lighting effect that responds to tempo of music being played.
3. Coordinate programming and any hardware required with AV contractor.

#### PART 2 - PRODUCTS - NOT USED

#### PART 3 - EXECUTION

##### 3.1 SPACE-BY-SPACE SEQUENCE OF OPERATION

A. Multi-Exercise:

1. Automatic on/off by occupancy sensor.
  - a. 20 min timeout.
2. Manual on/off and dimming by digital wallstation.
3. Emergency lighting controlled as above except in event of normal power loss at which point emergency battery inverter forces all connected lighting on to full power.

**B. Spinning Studio:**

1. Preset scene control with AV integration for scene recall.
  - a. Scene 1: Static saturated blue, blacklights on at full power.
  - b. Scene 2: Dynamic crossfade between saturated blue and cool white. Crossfade time modulates by music volume if source connected. If no audio crossfade time is 20 seconds; hold time is 10 seconds.
  - c. Scene 3: Dynamic crossfade between all colors red, green and blue. Crossfade time is 5 seconds; hold time is 2 seconds.
  - d. Scene 4: All luminaires on at full power in static white color.
  - e. Scene 5: to be field configured with owner input.
2. Local GUI page at AV system console with sliders for intensity and color wheel graphic for dynamic color control of each luminaire type in the space.
3. Emergency lighting controlled as above except in event of normal power loss at which point emergency battery inverter forces all connected lighting on to full power, full white operation.

**C. Other Spaces:**

1. Sequence of operations will be provided upon written request for all spaces not listed. Reprogramming may be required of some spaces on site after installation to tune the system and meet the owner, daylight and energy management needs. Provide additional programming for reconfiguration up to 24 hours at no additional cost to the owner or design team.

END OF SECTION

## SECTION 26 27 26 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes:
  - 1. Line Voltage Wall Switches
  - 2. Receptacles
  - 3. Plates

#### 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
- D. Section 26 05 26, Grounding and Bonding for Electrical Systems
- E. Section 26 05 33, Raceways and Boxes for Electrical Systems
- F. Section 26 05 53, Identification for Electrical Systems
- G. Section 26 05 80, Electrical Testing
- H. Section 26 09 23, Lighting Control Devices

#### 1.3 SUBMITTALS

- A. Product Data
- B. Completed Receptacle Testing and Acceptance Report Form.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Line Voltage Wall Switches:
  - 1. Hubbell
  - 2. Leviton
  - 3. Arrow-Hart
  - 4. Pass & Seymour
- B. Receptacles:
  - 1. Use same manufacture as the Line Voltage Wall Switches.
  - 2. Hubbell
  - 3. Leviton
  - 4. Arrow-Hart
  - 5. Pass & Seymour

## C. Plates:

1. Hubbell
2. Leviton
3. Arrow-Hart
4. Pass & Seymour

## 2.2 MATERIALS

- A. Extra heavy duty grade wiring devices, with special devices as noted on the Drawings. Should the Drawings indicate a device other than those listed. Device of same grade and manufacture as specified below. Furnish a matching plug connector for special purpose devices that do not have the common 120V NEMA 5-20R configuration.
- B. Lighting switches and duplex receptacles installed have similar appearance characteristics unless noted otherwise.

## 2.3 LINE VOLTAGE WALL SWITCHES

## A. Line Voltage Switches:

1. 20A rated, 277V, quiet type, extra heavy duty, heavy duty nylon toggle handle, back, and side wired with screw terminal connections.
2. As noted on the drawings provide:
  - a. Pilot light switch: lighted clear toggle.
  - b. Momentary Contact Switches: 15A, SPDT, center off.
  - c. Key Switches: 20A, 277V, back and side wired with screw terminal connections.

## B. Except as noted herein, device exposed finish color as follows:

1. Normal Power: To match existing building standard
2. Emergency Power: Red
3. Standby Power: Red

## 2.4 RECEPTACLES

## A. Standard Straight Blade Duplex Receptacle:

1. 3-wire, 2-pole with grounding, extra heavy duty, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
  - a. Provide hospital grade in patient care areas as required by NEC.
  - b. Provide tamper-resistant as noted on the drawings or NEC required.
  - c. Provide isolated ground as noted on the drawings or NEC required.
  - d. Provide surge suppression receptacles as noted on the drawings.
2. Ground Fault Interrupting straight blade duplex receptacle:
  - a. Heavy duty, 3-wire, 2 pole with grounding, self-testing, green "ON" LED to indicate power, red "ON" LED to indicate ground fault condition, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
    - 1) Provide hospital grade in patient care areas as required by NEC.

- 2) Provide tamper-resistant as noted on the drawings or where NEC required.
- 3) Provide weather-resistant rating at exterior locations as required by NEC.

B. Special Purpose Receptacles: As noted on Drawings with NEMA configurations.

## 2.5 PLATES

A. Flush Finish Plates:

1. Coordinated with Architect.
2. 0.04-inch thick, Type 302 stainless steel, brush finish.

B. Surface Covers:

1. Galvanized or cadmium plated steel, 1/2-inch raised industrial type with openings appropriate for device installed.
2. I

C. Identification:

1. Identify receptacle plates with a pre-printed label indicating serving panel and branch circuit number.
2. Refer to Section 26 05 53, Identification for Electrical Systems.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Devices and finish plates installed plumb with building lines. Install wall mounted receptacles vertically at centerline height shown on the Drawings.
- B. Finish plates and devices are not installed until final painting is complete. Scratched or splattered finish plates and devices will not be accepted.
- C. Switches, receptacles and/or other devices ganged into a common enclosure provided with a separation barrier between devices where the combined circuit voltages within the enclosure exceeds 300V.
- D. Provide GFCI receptacles as shown on the drawings or as NEC required. Provide a GFCI type duplex receptacle in each required location, do not sub-feed normal receptacles downstream of the GFCI receptacle to obtain the GFCI rating.
- E. Provide receptacles with GFCI, tamperproof, weather-resistant or hospital grade ratings as shown on the drawings, appropriate for the installation or required by NEC.

### 3.2 CORD CAPS

- A. Special plugs provided with the receptacles given to the Owner in their cartons with a letter stating the date and the Owner's representative that received the materials.

### 3.3 COORDINATION

- A. Electrical Drawings indicate the approximate location of devices. Refer to Architectural elevations, sections, and details for exact locations.



- B. Coordinate with equipment installer the locations and methods of connection to devices mounted in cabinets, counters, work benches, service pedestals, and similar equipment.

### 3.4 TESTING

- A. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct defective wiring.

END OF SECTION

## SECTION 26 50 00 - LIGHTING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes:
  - 1. Lenses
  - 2. Reflector Cones
  - 3. Housings
  - 4. Finish
  - 5. Suspension
  - 6. Lamps and Sockets
  - 7. Power Supplies
  - 8. Emergency LED Drivers
  - 9. Transformers
  - 10. Track Lighting Systems
  - 11. Custom Luminaires
  - 12. Exterior Luminaires
  - 13. Extra Material
  - 14. Disposal and Replacement

## 1.2 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 26, Electrical
- C. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
- D. Section 26 05 26, Grounding and Bonding for Electrical Systems
- E. Section 26 09 23, Lighting Control Devices
- F. Section 26 09 33, Central Dimming Controls
- G. Section 26 09 93, Sequence of Operations for Lighting Control
- H. Section 26 27 26, Wiring Devices

## 1.3 DEFINITIONS

- A. BACNET Protocol for integration with BAS/BMS/EMS
- B. BAS / BMS / EMS Building Automated System, Building Management System, Energy Management System
- C. CCT Correlated Color Temperature
- D. CRI Color Rendering Index

- 
- |    |              |   |
|----|--------------|---|
| E. | CS           | Control Station   |
| F. | D            | Dimming Wall Switch   |
| G. | DT           | Dual Technology (PIR + U)   |
| H. | FC           | Footcandles   |
|    | 1.           | The metric for measuring illuminance light levels                       |
| I. | GUI          | Graphic User Interface  |
| J. | LCP          | Lighting Control Panel  |
| K. | LED          | Light Emitting Diode  |
| L. | LonWorks     | Protocol for integration with BAS/BMS/EMS                               |
| M. | MTBF         | Minimum Time Between Failures   |
|    | 1.           | Total hours of testing / Number of failures                             |
| N. | OS/VS        | Occupancy Sensor / Vacancy Sensor,                                      |
|    | 1.           | Occupancy sensors provide automatic on and automatic shut-off.          |
|    | 2.           | Vacancy sensors provide automatic shut-off only, and require manual-on. |
| O. | PC           | Photocell   |
| P. | PIR          | Passive Infrared Technology   |
| Q. | Power Supply | Ballasts and LED drivers  |
| R. | RS           | RS-232 Connection for AV Integration                                    |
| S. | SC           | Scene Control   |
| T. | TC           | Timeclock, or astronomical timeclock                                    |
| U. | U            | Ultrasonic Technology   |
| V. | WS           | Wall Switch   |
| W. | WS/O         | Wallbox Occupancy Sensor Switch   |
|    | 1.           | Wall Switch with integrated Occupancy Sensor                            |

#### 1.4 QUALITY ASSURANCE

- A. The lighting design for this project was based on luminaire types and manufacturers as specified.
- B. Basis of Design manufacturers are pre-qualified to bid on products where specified. Inclusion of manufacturer and product series does not relieve specified manufacturer from providing product as described in luminaire schedule; modifications to standard product, if required, include with initial bid.
- C. Alternate manufacturers listed in the Luminaire Schedule do not require prior approval but included with the shop drawing submittal. Inclusion of manufacturer and product series as an alternate does not relieve the manufacturer from providing product equivalent to the basis of design as described in luminaire schedule; modifications to standard product, if required, include with initial bid.

- D. Or Approved or Pre-Bid Approved Equal:
1. Submit Substitution Request prior to bid, complying with requirements of Division 01, General Requirements.
  2. Approval determined by review of the following luminaire characteristics where applicable. Lack of pertinent data on characteristic constitutes justification for rejection of the submittal.
    - a. Performance:
      - 1) Distribution
      - 2) Utilization
      - 3) Average brightness/maximum brightness.
      - 4) Spacing to mounting height ratio.
      - 5) Visual comfort probability.
    - b. Construction:
      - 1) Engineering
      - 2) Workmanship
      - 3) Rigidity
      - 4) Permanence of materials and finishes.
    - c. Installation Ease:
      - 1) Captive parts and captive hardware.
      - 2) Provision for leveling.
      - 3) Through-wiring ease.
    - d. Maintenance:
      - 1) Relamping ease.
      - 2) Ease of replacement of ballast and lamp sockets.
    - e. Appearance:
      - 1) Architectural integration.
      - 2) Light tightness.
      - 3) Neat, trim styling.
      - 4) Conformance with design intent.

#### 1.5 GENERAL REQUIREMENTS:

- A. Provide lighting outlets indicated on the Drawings with a luminaire of the type designated and appropriate for the location.
- B. Where a luminaire type designation has been omitted and cannot be determined by the Contractor, request a clarification from the Architect in writing and provide a suitable luminaire type as directed.
- C. Coordinate installation of luminaires with the ceiling installation and other trades to provide a total system that is neat and orderly in appearance.
- D. Luminaires located in fire rated assemblies rated for use in such assemblies or have assembly maintained by the installer through the use of appropriate construction techniques to maintain the assembly rating. It is the responsibility of the contractor to maintain the assembly rating and provide required components during construction. Coordinate luminaires impacted with Division 01, General Requirements, and life safety documents.

- E. Install remote power supplies and transformers in enclosures as required by luminaire specified. Locate remote power supplies and transformers as shown on drawings; where no location is shown, provide recommendation for approval prior to commencing field installation. Remote mounted power supplies and transformers located within the distance limitations specified by the manufacturer.
- F. Exterior pole lights have an appropriated pole base as part of the assembly. For pole lights in pedestrian areas, use a flush pole base. Pole lights in parking areas a raised base used. Pole bases, footings, and structural components reviewed and approved by a state licensed structural engineer prior to ordering and installation.
- G. Linear lighting elements installed on building exterior, in coves, soffits, panels and other architectural materials are the longest sections available to meet the intent of the design and centered in the available space. Other items required to make the lights function installed out of site and coordinated with Architect, Landscape Architect, Lighting designer and Electrical engineer of record. Transformers, drivers, and ballasts in suitable enclosures. Required connection points are the minimum box or connector available from the manufacturer. No standard electrical boxes are allowed to produce linear runs in architectural coves. Ancillary material required is concealed from view. Coordinate final ceiling material, dimensions, and limitations with the ceiling manufacturer prior to ordering and installation.
- H. Coordinate voltage requirements to each luminaire as indicated on drawings.
- I. Verify luminaires carry a valid UL or ELT listing. Luminaires located in outdoor locations carry and appropriate wet or damp listing as required for the mounting application.
- J. Procure luminaires through a distributor located within 200 miles of the project site with a valid business license in the state the project is located.
- K. Upon request of the Architect, Engineer, or Owner, provide back-up pricing in a unit cost breakdown per luminaire. Back-up pricing includes distributor net pricing, contractor net pricing, final owner pricing and mark-ups and discounts (lot price or all-or-none) associated with the luminaires.
- L. Lighting related change orders include back-up pricing noted above for review by the engineer and lighting designer.
- M. Provide manufacturer's warranty covering 5 years on drivers from date of purchase. Luminaire manufacture to operate driver at or below the required driver warranty temperature. Luminaire manufacturers failing to operate the driver, at the project required ambient temperature, within the driver manufacturer warranty parameters will be responsible for driver warranty related costs over the warranty period.
- N. Minimum 80 percent of the luminaire material by weight should be recyclable at end of life. Design luminaire for ease of component replacement and end-of-life disassembly.

## 1.6 SUBMITTALS

- A. Submit the following in accordance with Section 26 05 00, Common Work Results for Electrical:
  - 1. Shop Drawings, to include:
    - a. Product Data.
      - 1) Provide manufacturer's published product data information.
      - 2) This information is to be relevant to the specified product only.

- 
- 3) Submittals limited to not more than three sheets for each type specified.
  - 4) They are specifically not to have configurations available included for review.
  - 5) Submittals that contain information that is not relevant to the product specified will be rejected in total and resubmission will be required.
  - b. Luminaire dimensions on a fully dimensioned line drawing.
  - c. Lamp information, including array configuration:
    - 1) For LED lamps: proof of conformance with the following: ANSI C78.377-2015, IES LM 79-2008, IES LM 80-2008, IES LM 82-2012, IES LM 84-14, IES LM 85-14, IES TM 21-2011, IES TM 28-14 and special certifications required by the contract documents.
  - d. Lamp socket information.
  - e. Power supply and transformer information using ballast manufacturers published product data information. Multiple power supplies or transformers may be submitted for single luminaire if compatible with specification included in contract documents. Include certification of lamp and power supply and transformer compatibility for submitted.
  - f. Mounting details including clips, canopies, supports, and methods for attachment to structure. Provide equipment required for row configurations.
  - g. UL/ETL Labeling Information
  - h. Manufacturer's Warranty
  - i. Photometric Reports consisting of the following:
    - 1) Candlepower distribution curves: Provide five plane candlepower distribution data at no more than 5 degree vertical angle increments.
    - 2) Coefficient of utilization table.
    - 3) Zonal lumen summary including overall luminaire efficiency.
    - 4) Luminaire luminance: Provide measured maximum brightness data for luminaires with reflectors and average brightness data for luminaires with refractors.
    - 5) Spacing to mounting height ratio. If parallel and perpendicular ratios differ, provide data on each plane.
    - 6) Pole information to include maximum supported effective projected area (EPA) and weight for the design wind speed, as well as structural calculations for each pole proposed.
    - 7) VCP calculations (where applicable): For general office lighting luminaires, provide typical VCP calculations for ceiling heights between 9-feet and 12-feet at 1-foot increments, for room sizes 20-feet by 20-feet and 30-feet by 30-feet.
  - j. Special requirements of the specification.
2. Operation and Maintenance Data:
    - a. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hard-cover binder for review. After review, Architect will deliver one copy to Owner.
      - 1) One complete set of final submittals of actual product installed, including product data and shop drawings. Include product data for actual power supply and transformer installed where applicable.
      - 2) List of lamps used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.

- 3) Re-lamping instructions for lamps that require special precautions (LED, tungsten halogen, metal halide, etc.).
  - 4) Lighting fixture cleaning instruction, including chemicals to be used or avoided.
  - 5) Parts list of major luminaire components and ordering information for replacement
  - 6) Copies of manufacturer warranties on product.
3. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
  4. Manufacturer's Installation Instructions:
    - a. Indicate application conditions and limitations of use stipulated by product testing agency.
    - b. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
  5. Closeout Submittals:
    - a. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.
    - b. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
    - c. Maintenance Materials: Furnish for Owner's use in maintenance of project.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.
- B. Luminaire assemblies UL listed.
- C. Luminaires UL listed appropriate to mounting conditions and application.
- D. Each luminaire family type (downlights, troffers, etc.) supplied by only one manufacturer.
- E. Recessed luminaires installed in fire rated ceilings and using a fire rated protective cover thermally protected for this application and carry a fire rated listing.
- F. Luminaires installed under canopies, roofs, or open areas and similar damp or wet locations UL listed and labeled as suitable for damp or wet locations.

### 2.2 LENSES

- A. Mechanically secured from within the housing.
- B. Interior linear prisms with smooth exterior.
- C. Prismatic Acrylic:
  1. 12-inch by 24-inches and Larger: Low brightness type, extruded of clear virgin acrylic plastic, 0.156-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 19 with flat sided male prisms running parallel with panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.

2. Or as specified in the Luminaire Schedule.
- D. Opal Acrylic:
  1. Extruded or injection molded of virgin acrylic plastic, 0.08-inch minimum overall thickness.
  2. As specified in the Luminaire Schedule.
- E. Opal Acrylic Overlay: High transmittance type, extruded of virgin acrylic plastic, 0.04-inch overall thickness, with minimum 80 percent light transmittance.

### 2.3 REFLECTOR CONES

- A. Spun of uniform gauge aluminum, free of spinning marks or other defects.
- B. Integral trim flange.
- C. Color and finish as specified in Luminaire Schedule.
- D. White Reflectors:
  1. Steel or aluminum, minimum 22 gauge, with hard baked white enamel finish with minimum 85 percent reflectance.
- E. Alzak Reflectors:
  1. Low iridescent semi-specular or as indicated in the luminaire schedule, Alzak or Coilzak with minimum reflectance of 90 percent.
  2. Supply luminaires using Alzak reflector cones by the same manufacturer unless directed otherwise in Luminaire Schedule.

### 2.4 HOUSINGS

- A. Dimensions:
  1. Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified in the luminaire schedule.
- B. Extruded Aluminum Housing:
  1. One piece housing of AA 6063 T5 extruded aluminum with 0.14 minimum thickness smooth and free of tooling lines in one uninterrupted section of 1-foot to 24-foot with the cross sectional dimensions as indicated in the Luminaire Schedule.
  2. Section lengths as shown on the drawings and able to be transported into and out of the installation location after final construction without building demolition being required.
- C. Steel Housing:
  1. 20 gauge minimum, free of dents, scratches, or other defects.
  2. Fill and sand exposed weld marks, joints, and seams smooth before finishing. Clean and dress edges to remove sharp edges or burrs.
  3. Section lengths as shown on the drawings comprised of 1-foot to 12-foot lengths.



- D. Sheet Metal Housings:
  - 1. Minimum 22 gauge cold-rolled steel, with welded joints. Exposed weld marks and seams filled and ground smooth.
- E. Door Frames for lensed luminaires:
  - 1. White painted, flat aluminum with mitered corners, [rotary cam] [spring assisted] latches to hinge from either side.
- F. End Plates:
  - 1. Mechanical attach die cast end plates without exposed fasteners. End caps, minimum 0.125-inch thick.
- G. Provide an internal alignment spline where housing sections are joined together to form a continuous row.
- H. Recessed Luminaires
  - 1. Rated for use in recessed applications.
  - 2. If required by the owner or design team, the manufacturer must produce test data proving the product is rated for use in recessed applications.
  - 3. Equip with through wire junction box. Box, power supply, and replaceable components accessible from the ceiling opening of the luminaire.
- I. Luminaires used as air-handling registers for HVAC systems meet the requirements of NFPA 90A.
- J. For wet and damp use, LED-based luminaire to be sealed, rated, and tested for appropriate environmental conditions and may not be accomplished by using an additional housing or enclosure

## 2.5 FINISH

- A. Visible surfaces to be of color and texture as directed in Luminaire Schedule.
  - 1. Baked white dry polyester powder, if not specified, with a minimum average reflectance of 85 percent on exposed and light reflecting surfaces.
- B. Concealed interior and exterior luminaire surfaces to be Matte black or as recommended by the luminaire manufacturer.
- C. Prepare steel components for finishing with a 5-step zinc phosphating process prior to painting.
- D. Paint luminaire (including painted component parts) after fabrication unless specifically noted in the Luminaire Schedule.
- E. Exposed aluminum surfaces:
  - 1. As indicated in the Luminaire Schedule.
  - 2. Treat with an acid wash and clear water rinse prior to painting.
  - 3. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.
- F. Exposed steel surfaces:
  - 1. Treat with acid wash and clear water rinse, then prime coat.

2. Electrostatically paint or powder coat and oven bake in the color indicated in the Luminaire Schedule.

## 2.6 SUSPENSION

- A. Suspension Devices, type as specified in the Luminaire Schedule:
  1. Aircraft Cable:
    - a. Stainless steel type - 3/32-inch nominal diameter, stranded, with positive pressure, field adjustable clamp at fixture connection.
  2. Rigid Pendant:
    - a. 1/2-inch nominal diameter or as specifically shown on drawings.
    - b. Supplied by fixture manufacturer when available as standard product.
    - c. At fixture end of stems, provide earthquake type swivel fitting to permit 45 degree swing in any direction away from vertical.
    - d. Flat canopy to permit splice inspection after installation.
  3. Chain Hangers:
    - a. Length to suit fixture mounting height if shown or as field conditions dictate.
    - b. Use two heavy duty chains with S hooks at each suspension point.
    - c. Length to suit mounting height as shown on Drawings.
  4. Suspension system must permit  $\pm 1/2$ -inch minimum vertical adjustment after installation.
- B. Supports:
  1. Provide internal safety cable from fixture body to structure.
  2. Carry fixture weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code.
- C. Feed Point:
  1. Flat-plate canopy to cover outlet box, with holes for support cable and power cord, concealed fasteners to permit splice inspection after installation.
  2. At the electrified connection provide straight cord feed. Provide a separate feed point where emergency feed is required.
  3. Power Cord:
    - a. White multi-conductor cord, parallel to support cable (aircraft cable); within pendant (rigid pendant); or flexible conduit (chain hanger).
  4. Provide a separate fee point where emergency feed is required.
- D. Non-feed Points:
  1. 1/2-inch OD polished chrome end sleeve, inside threaded 1/4-inch-20, with 2 -inch diameter. Flat white plate to cover hole in ceiling. Top of cable with ball swaged on end, to fit inside sleeve.
  2. Provide support above ceiling as required.
- E. Suspension method allows adjustment to be made in hanging length to allow for variance in ceiling height.

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- F. Exposed paintable suspension components have the same finish and color as the luminaire housing.

## 2.7 LAMPS AND SOCKETS

- A. Lamp each luminaire with the suitable lamp cataloged for the specific luminaire type and as indicated by the manufacturer, or as specifically indicated in the Luminaire Schedule, or as specified herein.
- B. Lamps to be field replaceable.
- C. Lamp sockets to be of configuration and design to accept standard LED lamps and circuit boards.
- D. LED lamps to meet or exceed 50,000 hours as defined by LM-80-08 based on both the ambient temperature listed and the LEDs B10L70 performance curve as published by the LED lamp manufacturer.
- E. LED lamps to be high brightness and proven quality from established and reputable LED manufacturers, including:
  - 1. Nichia
  - 2. Osram-SemiOpto
  - 3. Cree
  - 4. Philips Lumileds
  - 5. Seoul Semiconductor
  - 6. Bridgelux
  - 7. General Electric Gelcore
  - 8. Xicato
  - 9. Osram
- F. Replacement Lamps
  - 1. Sorra
  - 2. Toshiba
- G. LED lamps that are integral into the housing; light bars, diodes, boards and other, to be rated and tested for use in the fixture specified and compatible with the driver tested and compatible with that fixture.
- H. Screw-In Base Replacement LED Lamps
  - 1. Manufacturer to provide wattage restriction label on socket, equivalent to specified wattage on LED replacement lamp.
  - 2. LED replacement lamps not to be placed in air-tight enclosures or in insulated air tight (ICAT) rated luminaire enclosures without dedicated heat dissipation and thermal management of the luminaire system.
- I. Color Rendering Index (CRI):
  - 1. 80 or higher for ambient lighting in common spaces
  - 2. 90 or higher for accent lighting in common spaces

3. 95 or higher for art lighting
4. As indicated in the luminaire schedule
- J. Color Rendering Index (CRI): 90+ per ANSI C78.377-2008/CIE 13.3-1995 unless noted otherwise on the luminaire schedule.
- K. Correlated Color Temperature (CCT) per luminaire schedule.
  1. Color consistency not to exceed a +/- tolerance of greater than two MacAdam Ellipses over the life of the luminaire.
- L. Adjustable Lamp Mechanisms: To have aiming stops which can be permanently set to position lamp vertically and rotationally.
- M. High power LED luminaire thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware
- N. Operating Temperature: -22 degrees F to 115 degrees F.
  1. Operate below manufacturer's published die junction temperatures when operated at 1W at 350 mA in an elevated ambient of 46 degrees C.
- O. Utilize quick-connect connections to replaceable boards to meet ANSI and UL/ETL and NEMA requirements.

## 2.8 POWER SUPPLIES

- A. UL recognized under the component program and modular for simple field replacement.
- B. Rate for use with the LED array specified.
  1. Warranty array and driver as an assembly.
  2. 5 year full replacement, non-pro-rated warranty is required on electronic components.
- C. Luminaires requiring more than one driver are not permitted, unless specified in the luminaire schedule.
- D. Power supplies used in enclosed and gasketed luminaires listed for use in wet locations, Type 1 construction.
- E. Rate for the expected ambient temperature in which they are installed.
  1. Exterior installed power supplies rated to start the lamps at 0 degrees F.
- F. Operate for a (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.
- G. Power Factor: 0.9 minimum
- H. Lifetime minimum
  1. 50,000 hours at full load and 77 degrees F ambient
  2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
- I. Minimum time between failures (MTBF) greater than 300,000 hours at full load and 77 degrees F ambient, in accordance with MIL-HDBK-217.

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- J. Driver and luminaire electronics deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10).
    - 1. Flicker index to be less than 5 percent at frequencies below 1000 Hz.
  - K. Label systems using tandem wired luminaires be labeled accordingly. Locate label in the lamp compartment of each luminaire and identify the function of that luminaire. Do not make the label visible from room.
  - L. Total Harmonic Distortion less than 20 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. At no point in the dimming curve allow imbalance current to exceed full output THD.
  - M. Meet or exceed 30mA<sup>2</sup>s at 277VAC for up to 50Ws of load and 75A at 240us at 277VAC for 100 watts of load.
  - N. Withstand up to a 1,000V surge without impairment of performance as defined by ANSI C62.41 Category A.
  - O. Housing have circuit diagrams and lamp connections applied thereto.
  - P. Must be Reduction of Hazardous Substances (RoHS) compliant
  - Q. Provide no light output when the analog control signal drops below 0.5 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control deadband between 0.5V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.
  - R. Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
    - 1. Adjustment of forward LED voltage, supporting 3V through 55V.
    - 2. Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA
    - 3. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
  - S. Remote: Driver may be remote mounted up to 300-feet depending on power level and wire gauge.
  - T. Dimming Drivers:
    - 1. Dimming power supplies controlled by a common controller provided by the same manufacturer.
    - 2. Manufacturer to have minimum 5 years' experience in manufacturing of dimmable electronic lighting drivers.
    - 3. LED dimming to be equal in range and quality to a commercial grade incandescent dimmer. Quality of dimming to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experience in a commercial environment.

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- a. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
  4. Provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 – 1 percent light output and step to 0 percent where indicated. Driver responds similarly when raising from 0 percent to 100 percent.
    - a. Driver to be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.
  5. Track evenly across multiple fixtures at light levels, and provide input signal to output light level that allow smooth adjustment over the entire dimming range.
  6. Limit inrush current.
  7. No visible change in light output with a variation of plus/minus 10 percent line voltage input.
  8. Ability to configure a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels
  9. Basis of Design Product: eldoLED or subject to compliance and prior approval with specified requirements of this section, one of the following:
    - a. eldoLED
    - b. Philips
    - c. Osram Sylvania
    - d. Tridonic
    - e. General Electric
  10. Dimming Protocols:
    - a. If not otherwise noted on the luminaire schedule, dimming LED drivers to be 0-10V.
    - b. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers
      - 1) Must meet IEC 60929 Annex E for General White Lighting LED drivers
      - 2) Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
      - 3) Must meet ESTA E1.3 for RGBW LED drivers
      - 4) 0-10V input protected from line voltage miswire, and immune and output unresponsive to induced AC voltage on the control leads.
    - c. Digital Multiplex (DMX Low Voltage Controlled) Dimming Drivers
      - 1) Must meet DMX / RDM: ANSI/TIA-485, ANSI E1.11 - USITT DMX512A and ANSI E1.20 (Explore and Address)
      - 2) Capable of signal interpolation and smoothing of color and intensity transitions.
      - 3) Luminaires requiring more than one driver are not permitted.
      - 4) Drivers may be connected to the DMX bus by a T-tap spur not to exceed 12-inch in absolute length. In other cases, a DMX input and output connection must be provided.

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## 2.9 TRANSFORMERS

- A. Provide proper lamp voltage to low voltage lamps.
  - 1. Integral:
    - a. Magnetic: Encapsulated for silent operation, securely mounted to the luminaire and removable through the aperture for hard ceiling installations or remote where shown on drawings.
    - b. Electronic: Do not provide electronic transformers unless directed in the Luminaire Schedule.
  - 2. Remote:
    - a. Magnetic:
      - 1) [Encapsulated] [Toroidal] for silent operation, securely mounted accessible in location shown on drawings.
      - 2) Provide code-sized primary and secondary circuit protection via [fuses] [thermal magnetic circuit breakers], quantity of secondary circuits as required to serve specified load.
    - b. Electronic:
      - 1) Do not provide electronic transformers unless directed in the Luminaire Schedule.

## 2.10 TRACK LIGHTING SYSTEMS

- A. Lighting Track:
  - 1. Extruded aluminum track with extruded poly-vinyl insulator.
  - 2. 20A, copper conductor strips with separate ground to provide electrical and mechanical connection for the specified track mounted luminaires.
  - 3. Number of circuits as indicated in luminaire schedule, with separate neutrals per circuit.
  - 4. Provide connectors, elbows, stems, feed ends, end caps and fittings to make a complete system.
- B. Track Fittings:
  - 1. Provide positive mechanical and electrical connection for track heads to track.
  - 2. Removable fitting either twists into or snaps into specified lighting track.
- C. Luminaire dimensions: Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified.
- D. Adjustable Lamp Mechanisms:
  - 1. Adjustable aiming which can be set to position lamp vertically and rotationally.
- E. Transformers:
  - 1. Provide proper lamp voltage to low voltage lamps.
  - 2. Magnetic transformers encapsulated for silent operation.
  - 3. Integrally mount Magnetic and electronic transformers to luminaire.
- F. Finish: Visible surfaces to be of color and texture as directed in Luminaire Schedule.
- G. Labels: Track and track fittings compatible and be UL labeled and listed as a system.

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## 2.11 CUSTOM LUMINAIRES

- A. Custom luminaire manufacturer no less than five years of continuous experience in the design and manufacture of custom lighting elements of the type and quality shown.
- B. Specifications and drawings are intended to convey the features, function and character of the custom luminaire only and do not necessarily illustrate every component or detail required in the finished piece of equipment.
- C. Include details and components that are necessary for the proper appearance and functioning of the custom luminaire.
- D. Provide operational sample prototype luminaire for review and revision, if specified, of each custom luminaire type. Install and connect sample prototype luminaire by the contractor in a mutually acceptable location for demonstration and evaluation by the design team. Final judges on determining whether the prototype sample complies with specification is up to the Architect and Lighting Consultant.

## 2.12 EXTRA MATERIAL

- A. Furnish extra materials described below that match product installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Glass and plastic lenses, covers, louvers, globes, guards, and other removable fixture parts: 5 percent or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
  - 2. Control gear: 5 percent or one dozen (whichever is less) of each field-replaceable control module, driver, ballast, or individual fixture transformer. For fixtures with non-easily replaceable control gear provide 5 percent or one dozen (whichever is less) extra fixtures. Confirm non-replaceable products during submittal process.
  - 3. Adjustable accent lights (track, recessed, or surface mounted): 10 percent of each beam angle lens (or removable lens accessory), 10 percent or one dozen (whichever is less) additional accessory lenses, color filters, louvers, and other accessories specified for use during final focusing.
  - 4. For non-decorative LED lights, provide 2 percent additional fixtures, or minimum two fixtures.

## 2.13 DISPOSAL AND REPLACEMENT

- A. LED manufacturer is responsible for the disposal of expired LED arrays and heat sinks. Clearly label fixture with return information, disposal procedures and manufacturer disposal contact information.
- B. Owner will pay for shipping.
- C. Manufacturer is required to inform the owner of new power requirements and /or lumen output values if new replacement components prior to shipping replacement parts.
- D. Label disposal and replacement information inside the luminaire and in the project operation and maintenance manuals along with O&M requirements listed in Division 01, General Requirements.



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**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Meet general requirements of NFPA 70, National Electric Code.
- B. Mounting heights specified on drawings:
  - 1. Wall Mounted Luminaires:
    - a. Centerline of luminaire.
  - 2. Pendant Mounted Luminaires:
    - a. Bottom of luminaire unless specifically identified in the Luminaire Schedule or on drawings.
- C. Support:
  - 1. Support by separate means from the building structure and not from the ceiling system, ductwork, piping, or other systems.
  - 2. Final decision as to adequacy of support and alignment will be given by the Architect.
- D. Power Supplies:
  - 1. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
    - a. Ambient temperature: -4 degrees to 122 degrees F.
    - b. Relative humidity: Maximum 90 percent, non-condensing.
    - c. Protected from dust and excess moisture during installation.
  - 2. Install per manufacturers prescribed methods.
  - 3. Located remote mounted power supplies and transformers within the distance limitations specified by the power supply manufacturer.
- E. Level luminaires, align in straight lines, and locate as shown on the architectural elevations and reflected ceiling plan.
- F. Manufacturer's labels or monograms not visible after luminaire is installed, but must be included for future reference.
- G. Recessed Luminaires:
  - 1. Trims which fit neatly and tightly to the surfaces in which they are installed without light leaks or gaps.
  - 2. Install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between luminaires trim and the surface to which they are mounted.

**3.2 COORDINATION OF WORK**

- A. Architectural Reflected Ceiling Plans take preference as to the exact placement of the luminaires in the ceiling.
- B. Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

### 3.3 AIMING

- A. Aim luminaires with proper lamps installed.
- B. Aim directional luminaires, including but not limited to luminaires described in the Contract Documents or by the luminaire manufacturer as aimable, adjustable, or asymmetric as follows:
  - 1. Provide the lighting pattern for which the luminaire is designed.
  - 2. Provide the lighting pattern as shown on the drawings.
  - 3. Predetermined aiming points as shown on the drawings.
  - 4. Where aiming cannot be determined, request, in writing, clarification from the Architect, indicating luminaires needing clarification.
- C. Re-aim luminaires as determined by Architect during final project walkthrough.
- D. Install adjustable luminaires with dead zone of rotation away from intended aiming point

### 3.4 PROJECT CLOSEOUT

- A. Leave luminaires clean at the time of acceptance of the work. If luminaires are deemed dirty by the Architect at completion of the work, clean them at no additional cost. Protective plastic wrap is to be removed from parabolic luminaires just prior to owner acceptance.
- B. Provide fixtures with new lamps operating at time of final acceptance. Exception: For fluorescent dimming fixtures, provide minimum 100 hour/maximum 200 hour, continuously lit lamps or per ballast manufacturer's recommendations.
- C. Where incandescent lamps are used for construction lighting, replace the lamps with new lamps just prior to occupancy by the owner.

END OF SECTION

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**SECTION 27 01 05 - DESIGN-BUILD COMMUNICATIONS SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Communications systems shall be provided by design-build subcontractor as follows:
1. Communications Systems Contractor shall provide for and obtain all necessary permits and inspections as required from regulatory agencies.
  2. Electrical Contractor in coordination with Communications Systems Contractor shall be the permit holder and shall be responsible for the proper design and installation of the communications systems for the entire renovated space.
  3. Communications Systems work shall be Bidder design-build and shall comply with all governing code requirements.
  4. All Division 27 "Communications" Work shall comply with OSU's published standards. Bidder design-builder shall provide materials, labor, submittals and installation complying with the following Sections published online and available for download from the link indicated below.
    - a. Link: <https://fa.oregonstate.edu/cpd-standards/27-communication>
    - b. Sections, Standards:
      - 1) Section 27 10 01 "Structured Cabling General Requirements."
      - 2) Section 27 11 00 "Communication Equipment Room Fittings" where applicable to scope.
      - 3) Section 27 13 00 "Communications Backbone Cabling."
      - 4) Section 27 15 00 "Communications Horizontal Cabling."
      - 5) Section 27 40 00 "Audio-Visual Communications."

**1.2 SUBMITTALS**

- A. Communications Systems Contractor shall provide all communication systems documentation as required for Architect and Owner review and approval and as necessary for construction. Include all information indicated in OSU Standards listed above, and include the following:
1. Product data for all equipment and cabling.
  2. All shop drawings as required for construction. Related Requirements:
- B. At completion, provide the following:
1. O&M manual for equipment and lighting installed.
  2. The contractor shall submit shop drawings as AutoCAD files to the Owner.

3. Identify all cabling/ conductors, drops and punchdowns at each jack and panel on index in existing and new panels as applicable when complete.

### 1.3 QUALITY ASSURANCE

- A. Communications Systems Contractor shall coordinate power and mounting requirements with the intent of the Documents; Communications Systems Contractor shall perform calculations to verify cabling is properly sized.
- B. Installer Qualifications: Installer shall be approved by OSU as indicated in OSU's Section 27 10 01 "Structured Cabling General Requirements" available in link above.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Provide all required materials, components and equipment required for communication systems, complying with OSU Standards and applicable codes.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Conceal conduit and junction boxes to the fullest extent possible. Where conduit or junction boxes cannot be concealed, notify the Architect and coordinate locations to be as unobtrusive as possible.

END OF SECTION 27 01 05