



Division of Finance and Business Operations

Wayne State University
C.S. Mott Lab Renovations
WSU Project Number 609-408429

FOR:

Board of Governors
Wayne State University
Detroit, Michigan

Owner's Representative:

Mark Gibbons, Project Manager
Facilities Planning & Management
Design & Construction Services
5454 Cass
Wayne State University
Detroit, Michigan 48202

Purchasing Agent:

Valerie Kreher, Senior Buyer
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720
rfpteam2@wayne.edu

Consultant:

i-Design Solutions, LLC
4020 N. Milford Road
Milford, MI. 48381

February 17, 2025

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Project Specific WSU Wage Schedule (posted separately)
<https://procurement.wayne.edu/vendors/wage-rates>

INFORMATION FOR BIDDERS

OWNER: Board of Governors
Wayne State University

PROJECT: **C.S. Mott Lab Renovations**
Project No. **609-408429**

LOCATION: Wayne State University
275 East Hancock Avenue
Detroit, Michigan 48202

PURCHASING AGENT: **Valerie Kreher, Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720
rfpteam2@wayne.edu

OWNER'S REPRESENTATIVE: **Mark Gibbons, Project Manager**
Facilities Planning & Management
Design & Construction Services
Wayne State University
5454 Cass Avenue
Detroit, Michigan 48202

Architect: **i-Design Solutions, LLC**
4020 N. Milford Road
Milford, MI. 48381

SPECIAL NOTE: Right to reject any and all proposals, either in whole or in part and to waive any irregularities therein is reserved by the Owner.

BIDS ADVERTISED: February 17, 2025

BIDDING: Bidding documents may be obtained by vendors from the University Purchasing Web Site at <http://go.wayne.edu/bids> beginning **February 17, 2025**. When visiting the Web Site, click on the "**Construction**" link in green. Copies of the RFP will not be available at the pre-proposal meeting.

Optional Pre-Bid Conference: To participate, it is **Optional** that you and/or responsible representatives of your organization attend our pre-bid conference, to be held on **January 23, 2025, 10:30 am (Eastern - Detroit Time)**.

Vendors who would like to participate in the pre-bid meeting via a TEAMS Video Conference or Conference Call, may do so via the information below:

Microsoft Teams Meeting
On-line or via Conference Call

[Join the meeting now](#)

Need to join from a mobile device but don't have TEAMS on it?

[Visit our website](#) for instruction on adding TEAMS to your device.

Attendance will be taken during the Prebid Meeting. When Pre-proposal Meetings are Optional, nominal scorecard points will be awarded for attendance.

OPTIONAL Site Visit (if needed): A Site visit may be scheduled at the conclusion of the pre-bid meeting, at the discretion of the project manager. The tentative date for Site Visit is **January 30, 2025 at 7:30 – 9:30 am**.

DUE DATE FOR QUESTIONS: Due Date for questions shall be **February 3, 2025 at 12:00 Noon**. All questions must be reduced to writing and emailed to the attention of **Valerie Kreher, Senior Buyer** at **rfpteam2@wayne.edu**.

Bids Due: Proposals for lump-sum General Contract will be received by electronic submission on **February 7, 2025**, until 2:00 p.m. (local time). The link for bid submission will be posted with the bid details at <http://go.wayne.edu/bids> beginning **February 17, 2025**. Vendors are required to combine documents into one PDF to ensure no portion of your response is inadvertently omitted. This includes your bid, bid bond, and any other documents.

No public bid opening will be held.

Bid Qualification Meeting: Bidders must be available for a bid prequalification meeting, as soon as the day following the bid opening. The lowest qualified bidder will be contacted and requested to meet with Facilities Planning & Management at their office located at 5454 Cass Avenue, Detroit, MI 48202. During this meeting, the Vendor must provide information on the qualifications of management and supervisory personnel assigned to the project, a **Project Schedule** and a **Schedule of Values**, including a list of Contractor's suppliers, subcontractors, and other qualifications. This information should include information on the contractor's and any subcontractor's access to labor necessary for contract performance.

If all aspects of the bid are in order, an unsigned contract will be given to the successful Contractor as soon as it's available. The Contractor has 5 business days to return the contract to the Project Manager for University counter signature. The contractor must also submit a Performance Bond as outlined above, and a Certificate of Insurance in the same 5 business day period. In the event the Contractor fails to return the documents in this 5-day period, the University reserves the right to award the contract to the next lowest qualified bidder.

All available information pertaining to this project will be posted to the Purchasing web site at <http://go.wayne.edu/bids>.

Information that is not posted to the website is not available/not known

INSTRUCTIONS TO BIDDERS

OWNER: Board of Governors
Wayne State University

PROJECT: **C.S. Mott Lab Renovations**
Project No. **609-408429**

LOCATION: Wayne State University
275 East Hancock Avenue,
Detroit, Michigan 48202

PURCHASING AGENT: **Valerie Kreher, Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720
rfpteam2@wayne.edu

1. PROPOSALS

- A. Procurement will receive Proposals for the work as herein set forth on **February 7, 2025**, until 2:00 p.m. (local time). The link for bid submission will be posted with the bid details at <http://go.wayne.edu/bids>. **No public bid opening will be held.**
- B. Proposals shall be for a **lump-sum General Contract for the entire work of the Project as provided in the Form of Proposal.**
- C. Proposals shall be submitted by electronic submission on forms furnished with the Bidding documents. The link for bid submission will be posted with the bid details at <http://go.wayne.edu/bids> beginning **February 17, 2025**. The forms must be completed in its entirety and must be signed, and the completed forms shall be without alterations, interlineations, or erasures. Forms shall contain no recapitulations of the work to be done.
- D. All base bids must be conforming to the detailed specifications and drawings provided by the University, including any Addenda issued. Voluntary Alternates will only be considered if the Contractor has also submitted a conforming base bid. Any stipulation of voluntary alternates or qualifications contrary to the Contract requirements made by the Bidder in or accompanying his proposal as a condition for the acceptance of the Contract will not be considered in the award of the Contract and will cause the rejection of the entire Proposal.
- E. The competency and responsibility of Bidders will be considered in making the award. The University is not obligated to accept the lowest or any other bids. **The University reserves the right to reject any and all bids and to waive any informalities in the Proposals.**

2. PROPOSAL GUARANTEE

- A. A satisfactory Bid Bond executed by the Bidder and Surety Company, in an amount equal to not less than five percent (5%) of the maximum proposal amount shall be submitted with each Proposal, which amount may be forfeited to the Board of Governors, Wayne State University, if the successful Bidder refuses to enter into a Contract within ninety (90) days from receipt of Proposals.
- B. Bond must be issued by a Surety Company with an A or A- rating as denoted in the AM Best Key Rating Guide.
- C. Bid bonds shall be accompanied by a Power of Attorney authorizing the signer of the bond to do so on behalf of the Surety Company.

- D. Withdrawal of Proposals is prohibited for a period of ninety (90) days after the actual date of opening thereof.

3. CONTRACT SECURITY

- A. The successful Bidder will be required to furnish a Performance Bond and Labor and Material Payment bond in an amount equal to 100% of the contract award amount, and include such cost in the Proposal, complying with University policy and the laws of the State of Michigan.
- B. Performance Bond and Labor and Material Payment Bond shall be from a surety company acceptable to the Owner and made payable as follows:
 - (1) A bond for 100% of the contract award amount to the Board of Governors of Wayne State University, and guaranteeing the payment of all subcontractors and all indebtedness incurred for labor, materials, or any cause whatsoever on account of the Contractor in accordance with University policy and the laws of the State of Michigan relating to such bonds.
 - (2) A bond for 100% of the contract award amount to the Board of Governors of Wayne State University to guarantee and insure the completion of work according to the Contract.
- C. The only acceptable Performance Bond shall be the AIA A312 – 2010.
- D. Bond must be issued by a Surety Company with an A or A- rating as denoted in the AM Best Key Rating Guide.

4. BOND CLARIFICATION

For bids below \$50,000.00,

- A. Bid bond will not be required.
- B. Performance and Material & Labor Payment bonds will not be required.

5. INSPECTION

- A. Before submitting its Proposal, each Bidder shall be held to have visited the site of the proposed work and to have familiarized themselves as to all existing conditions affecting the execution of the work in accordance with the Contract Documents. No allowance or extra consideration on behalf of the Contractor will subsequently be made by reason of its failure to observe the Conditions or on behalf of any subcontractor for the same reason.

6. EXPLANATION TO BIDDERS AND ADDENDA

- A. Neither the Owner nor Representative nor Purchasing Agent will give verbal answers to any inquiries regarding the meaning of drawings and specifications, and any verbal statement regarding same by any person, previous to the award, shall be unauthoritative.
- B. Any explanation desired by Bidders must be submitted in writing to the Purchasing Agent, and if explanation is necessary, a reply will be made in the form of an Addendum, a copy of which will be distributed via the appropriate Listserv maintained by Procurement & Strategic Sourcing, and will be posted to the website.
- B. All addenda issued prior to date of receipt of Proposals shall become a part of these Specifications, and all proposals are to include the work therein described.

7. INTERPRETATION OF CONTRACT DOCUMENTS

- A. If any person contemplating submitting a bid for the proposed Contract is in doubt as to the true meaning of any part of the drawings, specifications, or other Contract Documents, he may submit to the Purchasing Agent, a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the Contract Documents will be made by an addendum duly issued. A copy of such addendum will be posted to the website and distributed via the listserv. Each proposal submitted shall list all addenda, by numbers, which have been published prior to the time scheduled for receipt of proposal.

8. SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. Whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided that the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance, appearance and function. It shall not be purchased or installed by the Contractor without the Architect's written approval.

9. TAXES

- A. The Bidder shall include in his lump sum proposal and make payment of all Federal, State, County and Municipal taxes, including Michigan State Sales and Use Taxes, now in force or which may be enacted during the progress and completion of the work covered. Information regarding the State of Michigan sales and use tax laws can be found in [SOM Revenue Administrative Bulletin 2016-18](#).

10. REQUIREMENTS FOR SIGNING PROPOSALS AND CONTRACTS

- A. The following requirements must be observed in the signing of proposals that are submitted:
- (1) Proposals that are not signed by individuals making them shall have attached thereto a Power of Attorney, evidencing the authority to sign the Proposal in the name of the person for whom it is signed.
 - (2) Proposals that are signed for partnership shall be signed by all of the partners or by an Attorney-in-Fact. If signed by an Attorney-in-Fact, there must be attached to the Proposal a Power of Attorney evidencing authority to sign the Proposal, executed by the partners.
 - (3) Proposals that are signed for a corporation shall have the correct corporate name thereof and the signature of the President or other authorized officer of the corporation, manually written in the line of the Form of Proposal following the words "signed by". If such a proposal is signed by an official other than the President of the Corporation, a certified copy of resolution of the Board of Directors, evidencing the authority of such official to sign the bid, shall be attached to it. Such proposal shall also bear the attesting signature of the Secretary of the Corporation and the impression of the corporate seal.

11. QUALIFICATIONS OF BIDDERS

- A. The Owner may request each of the three (3) low bidders to submit information necessary to satisfy the Owner that the Bidder is adequately prepared to fulfill the Contract. Such information may include past performance records, list of available personnel, plant and equipment, description of work that will be done simultaneously with the Owner's Project, financial statement, or any other pertinent information. This information and such other information as may be requested will be used in determining whether a Bidder is qualified to perform the work required and is responsible and reliable.

12. **SPECIAL REQUIREMENTS**

- A. The attention of all Bidders is called to the General Conditions, Supplementary General Conditions, and Special Conditions, of which all are a part of the Specifications covering all work, including Subcontracts, materials, etc. Special attention is called to those portions dealing with Labor Standards, including wages, fringe benefits, Equal Employment Opportunities, and Liquidated Damages.
- B. Prior to award of the project, the apparent low bidder will be required to produce a **schedule of values** which will include the proposed subcontractors for each division of work and whether the subcontractor is signatory or non-signatory. A contract will not be issued to the apparent low bidder until this document is provided. A contractor will have 5 business days to produce this document. If the required document is not received within this time, the bidder will be disqualified.

13. **NOTICE OF AWARD/ACCEPTANCE OF BID PROPOSAL**

- A. The Proposal shall be deemed as having been accepted when a copy of the Contract (fully executed by both the vendor and the appropriate signatory authority for the University), with any/all Alternates, Addenda, and Pre-Contract Bulletins, as issued by the office or agent of the Owner has been duly received by the Contractor. After signing the Contracts, the Contractor shall then return all copies, plus any required bonds and certificates of insurance, to the office of the Owner's Representative, at 5454 Cass, Wayne State University, Detroit, MI 48202. Construction will begin when the fully-executed contract has been returned to the Contractor.

14. **TIME OF STARTING AND COMPLETION**

- A. It is understood that the work is to be carried through to substantial completion with the utmost speed consistent with good workmanship and to meet the established start and completion dates.
- B. The Contractor shall begin work under the Contract without delay, upon receipt of a fully-executed contract from the Owner, and shall substantially complete the project ready for unobstructed occupancy and use of the Owner for the purposes intended within the completion time stated in the Contract.
- C. The Contractor shall, immediately upon receipt of fully-executed contract, schedule his work and expedite deliveries of materials and performance of the subcontractors to maintain the necessary pace for start and completion on the aforementioned dates.

15. **CONTRACTOR'S PERFORMANCE EVALUATION**

In an effort to provide continuous process improvement regarding the construction of various university projects, Wayne State University is embarking upon a process of evaluating the contractor's overall performance following the completion of work. At the conclusion of the construction project a subjective evaluation of the Contractor's performance will be prepared by the Project Manager and the supervising Director of Construction. The evaluation instrument that will be used in this process is shown in Section **00440-01 - Contractor's Performance Evaluation**.

16. **BIDDING DOCUMENTS**

- A. Bid specifications are available online beginning **February 17, 2025** through Wayne State University Procurement & Strategic Sourcing's Website for Advertised Bids: <http://go.wayne.edu/bids>. The plans for this project can be viewed in advance and/or printed from the above website. Copies of the RFP will not be available at the pre-proposal meeting.

B. **DOCUMENTS ON FILE**

- (1) *Wayne State University Procurement & Strategic Sourcing's Website.*
All available information pertaining to this project will be posted to the Purchasing web site at <http://go.wayne.edu/bids>.
Information that is not posted to the website is not available/not known.
- (2) Notification of this Bid Opportunity has been sent to those entities registered with our ListServ. Available ListServes can be found at
http://www.forms.procurement.wayne.edu/Adv_bid/Adv_Bid_Listserve.html
- (3) Please note: Bid notices will be sent only to those Vendors registered to receive them via our Bid Opportunities list serve. To register, to <http://go.wayne.edu/bids>, and click on the "Join our Listserve" link at the top of the page.

15. Smoke and Tobacco-Free Policies

On August 19, 2015, Wayne State joined hundreds of colleges and universities across the country that have adopted smoke- and tobacco-free policies for indoor and outdoor spaces. Contractors are responsible to ensure that all employees and all subcontractors' employees are in compliance anytime they are on WSU's main, medical, or extension center campuses. The complete policy can be found at <http://wayne.edu/smoke-free/policy/>.

Notice of Optional Pre-Bid Conference

PROJECT: **C.S. Mott Lab Renovations,**

PROJECT NOS.: **WSU PROJECT NO. 609-408429**

It is **Optional** that each Contractor proposing to bid on this work must attend a pre-bid conference as a condition for submitting a proposal.

Vendors who would like to participate in the pre-bid meeting via a TEAMS Video Conference or Conference Call, may do so via the information below:

**Microsoft Teams Meeting
On-line or via Conference Call**

[Join the meeting now](#)

Need to join from a mobile device but don't have TEAMS on it?

[Visit our website](#) for instruction on adding TEAMS to your device.

Attendance will be taken during the Prebid Meeting. When Pre-proposal Meetings are Optional, nominal scorecard points will be awarded for attendance.

The purpose of this conference is to clarify the procedures, scope of work, and to identify any omissions and/or inconsistencies that may impede preparation and submission of representative competitive bids.

In the event that less than 3 individual contractor firms attend the pre-bid conference, the University reserves the right, at its sole discretion, to either reschedule the pre-bid conference or proceed and offer a second pre-bid conference date. (Attendance at only one pre-bid conference will be required).

Minutes of the conference shall be posted to the Website at <http://go.wayne.edu/bids>.

Any clarifications or corrections that cannot be made at the conference will be by Addendum.

All available information pertaining to this project will be posted to the Purchasing web site at <http://go.wayne.edu/bids>.

Information that is not posted to the website is not available/not known.

AGENDA

- I. Welcome and Introductions
 - A. Wayne State University Representatives
 - B. Vendor Representatives
 - C. Sign in Sheet- be sure to include your company name and representative in attendance on the sign in sheet.
- II. Brief Overview of Wayne State University
 - A. Purpose and Intent of RFP.
 - B. Detailed review of the RFP and the requirements for a qualified response.
 - C. Review of all pertinent dates and forms that are REQUIRED for a qualified response.
- III. Vendor Questions/Concerns/Issues
 - A. Questions that can be answered directly by the appropriate person in this meeting will be answered and both question and answer will be recorded in the minutes of the meeting.
 - B. Questions that need to be researched will be answered and a nature of clarification will be emailed to the appropriate ListServ. See http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_Bid_Listserve.html for a list of ListServ Bid Lists.
 - C. Minutes will be emailed to the appropriate ListServ.
 - D. Questions and concerns that come up after this meeting are to be addressed to **Valerie Kreher**, Procurement & Strategic Sourcing. Discussion with other University members is seriously discouraged and could lead to disqualification from further consideration. All questions and answers will be recorded and emailed to all participants of the RFP.
 - E. Due date for questions is **February 3, 2025**, 12:00 noon.
- IV. Minimum Participation
 - A. If less than 3 individual contractor firms attend the **Optional** pre-bid meeting, the University reserves the right, at its sole discretion, to either reschedule the pre-bid conference or proceed and offer a second pre-bid conference date. (Attendance at only one pre-bid conference will be required).
 - B. On the day of the bid opening, if less than 3 sealed bids are received, the University reserves the right, at its sole discretion, to rebid the project in an effort to obtain greater competition. If the specifications are unchanged during the rebid effort, any contractor who submitted a bid will be given the option of keeping its bid on file for opening after the second bid effort, or of having the bids returned to them unopened.
- V. Proposal Due Date: **February 7, 2025**, 2:00 p.m.
- VI. Final Comments
- VII. Adjourn

VENDOR NAME _____

GENERAL CONTRACT - PROPOSAL FORM

Sealed proposals for lump-sum General Contract will be received at the office of the Procurement & Strategic Sourcing by **electronic submission on February 7, 2025**, until 2:00 p.m. (local time). The link for bid submission will be posted with the bid details at <http://go.wayne.edu/bids> beginning **February 17, 2025**.

Please Note – Vendors must Pre-qualify themselves when responding to this bid opportunity. Our Prequalification questions can be found on page 4 of this section.

OWNER: Board of Governors
Wayne State University

PROJECT: **C.S. Mott Lab Renovations**

PROJECT NO.: WSU PROJECT NO. **609-408429**

PROJECT TYPE: **General contractor Work**

PURCHASING AGENT: **Valerie Kreher, Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3720
rfpteam2@wayne.edu

OWNER'S REPRESENTATIVE: **Mark Gibbons, Project Manager**
Design & Construction Services
Facilities Planning & Management
5454 Cass Avenue
Detroit, Michigan 48202

TO: Board of Governors
Wayne State University
Detroit, Michigan

PREBID MEETING: Did your company attend the **Optional** Pre-Bid Conference?
Yes _____ No _____

BASE PROPOSAL: The undersigned agrees to enter into an Agreement to complete the entire work of the **C.S. Mott Lab Renovations** project (WSU Project No. **609-408429**) in accordance with the Bidding Documents for the following amounts:

_____ \$ _____ Dollars

WSU WAGES: Did your company quote based upon **Union or WSU Wage Rates** as required?
Yes _____ No _____

CONFLICT OF INTEREST:

Are you or any Officer, Owner or Partner in this company an employee of Wayne State University, or have you been an employee within the past 24 months? If Yes, explain below.

Yes _____ No _____

Are any immediate family members of any Officer, Owner or Partner in this company employees of Wayne State University? If Yes, explain below.

Yes _____ No _____

LAWN REPLACEMENT:

The undersigned agrees that, in the event of existing lawn or landscaping damage, due to the Contractor's work, that has not been properly addressed and repaired to the satisfaction of the University, the University may repair/replace the lawn and/or landscaping, and that the expense will be at a **unit cost of \$15.00 per square yard for lawn, and landscaping at a rate of 1.5 times the cost of said repairs**, the full cost of which shall be reimbursed by the contractor.

CONTRACT CHANGE ORDERS:

The undersigned agrees to the following pricing formula and rates for changes in the contract work:

Where changed Work is performed, the Contractor may add to the total estimated actual cost for such Work no more than ten (10%) for subcontractor mark-up and seven and one-half percent (7.5%) for self-performed trade work for profit, overhead, insurance, taxes, indirect supervision, bonds, and any other costs not allowed by section 4.02.01

Within 14 days of the project's contract execution Contractor shall provide to the Owner; Subcontractor's hourly labor rate breakdown details. This requirement shall extend to the lowest level of subcontractor participation.

* Job and general overhead includes supervision and executive expenses; use charges on small tools, scaffolding, blocking, shores, appliances, etc., and other miscellaneous job expenses.

** Net labor cost is the sum of the base wages, fringe benefits established by governing trade organizations, applicable payroll taxes, and increased expense for contractor's liability insurance (Workman's Compensation, P.L. and P.D.).

TIME OF COMPLETION:

The Contract is expected to be fully executed on or about 25 calendar days after successful bidder qualification and recommendation of award. The undersigned agrees to start construction **immediately after** receipt of a fully executed contract, and to complete the work as follows:

Substantial Completion will be completed no later than **June 6, 2025**.

LIQUIDATED DAMAGES:

It is understood and agreed that, if project is not completed within the time specified in the contract plus any extension of time allowed pursuant thereto, the actual damages sustained by the Owner because of any such delay, will be uncertain and difficult to ascertain, and it is agreed that the reasonable foreseeable value of the use of said project by Owner would be the sum of **\$100.00 per day**, and therefore the contractor shall pay as liquidated damages to the Owner the sum of **\$100.00 per day** for each day's delay in substantially completing said project beyond the time specified in the Contract and any extensions of time allowed thereunder.

TAXES:

The undersigned acknowledges that prices stated above include all applicable taxes of whatever character or description. Michigan State Sales Tax is applicable to the work. Bidder understands that the Owner reserves the right to reject any or all bids and to waive informalities or irregularities therein.

ADDENDA:

The undersigned affirms that the cost of all work covered by the following Addenda are included in the lump sum price of this proposal.

Addendum No. _____ Date _____ Addendum No. _____ Date _____
 Addendum No. _____ Date _____ Addendum No. _____ Date _____
 Addendum No. _____ Date _____ Addendum No. _____ Date _____
 Addendum No. _____ Date _____ Addendum No. _____ Date _____
 Addendum No. _____ Date _____ Addendum No. _____ Date _____

CONTRACTOR'S PREQUALIFICATION STATEMENT & QUESTIONNAIRE:

Our Minimum Requirements for Construction Bids are:

WSU considers this project: General contractor Work.

Criteria	Small Project bid less than \$50,000	Medium Project bid between \$50,001 and \$250,000	Large Project bid between \$250,001 and \$2 million	Very Large Project bid greater than \$2 million
EMR Rating (Experience Modification Rating)	1.0 or Less	1.0 or Less	1.0 or Less	1.0 or Less
Bondable Vendor	N.A.	Required	Required	Required
Length of Time in Construction Business	2 Years	3 Years	5 Years	5 Years
Demonstrated Experience in Projects Similar in Scope and Price in the last 3 years	1 or more	1 or more	2 or more	3 or more
Unsuccessful Projects on Campus in last 3 years	None Allowed	None Allowed	None Allowed	None Allowed
Failure to comply with WSU Wage and/or Project Labor requirements	None Allowed	None Allowed	None Allowed	None Allowed
Withdrawn University Bid (with or without Bond forfeiture) within the last 3 years **	1 or less	1 or less	1 or less	1 or less
Company currently not in Chapter 11 of the US Bankruptcy Code	1 Year	2 Years	3 Years	3 Years

** Withdrawal of a bid is subject to the University suspension policy, for a period up to one year.

Contractors must complete the following information to determine their eligibility to participate in this bid. This information is required with your Bid to the University

Failure to complete this form in its entirety will result in your bid being disqualified.

Check one of the following on the makeup of your company:

_____ Corporation

_____ Individual

_____ Partnership

_____ Joint Venture

_____ Other (Explain below):

Diversity Classification: Please indicate the appropriate diversity classification for your company. The University recognizes the following groups as diverse or disadvantaged:

- Majority Owned _____
- Minority Business Enterprises (MBE) _____
- Women Business Enterprises (WBE) _____
- Disabled Veteran Enterprises (DVBE) _____
- Disabled Person Enterprises (DBE) _____
- Veteran Owned Businesses (VBE) _____
- Small Businesses per the US Small Business Administration (SBE) _____
- Other (Please Explain): _____

1. How many years has your organization been in business as a contractor? _____

2. How many years has your organization been in business under its present business name? _____

3. List states in which your organization is legally qualified to do business. _____

4. Provide the Name and Address of your Liability Insurance Carrier. _____

5. What is your current EMR Rating? _____
The minimum requirement is an EMR Rating of 1.0 or less for all projects. Bidders with a rating higher than 1.0 understand that their bid may be disqualified, at the sole discretion of the University.

6. What percentage of work performed on projects are by company employees; excluding any hired subcontracting and outsourced relationships, for the bid submitted? _____ %

7. What percentage of work performed on your company's behalf are by subcontracted business relationships; disallowing 1099 contracting work forces, for the bid submitted? _____ %

8. Have you ever failed to complete any work awarded to you? If so, attach a separate sheet of explanation. Include the name of the Project, the customer, the dates of the work, and the amount of the contract?

9. Have you withdrawn a bid after a University bid opening and/or refused to enter into a contract with the University upon notification of award within the last 3 years? If so, state the Project Name and Number, and the date of bid submission below.

10. Has any officer or partner of your organization ever been an officer or partner of another organization that failed to complete a construction contract? If so, attach a separate sheet of explanation.

11. List the construction experience of the principals and superintendents of your company.

Name: _____ Title: _____

Name: _____ Title: _____

Name: _____ Title: _____

12. List the construction Projects, and approximate dates, when you performed work similar in Scope to this project.

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

13. List the construction Projects, and approximate dates, when you performed work similar in Dollar Amount to this project.

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

14. Is your Company "bondable"? Yes _____ No _____

15. What is your present bonding capacity? \$ _____

16. Who is your bonding agent?

NAME: _____

ADDRESS: _____

PHONE: (_____) _____

CONTACT: _____

17. Does your company agree to provide financial reports to the University upon request? Failure to agree may result in disqualification of your bid? (select one): Yes _____ No _____
18. Does your company agree that all of the Terms and Conditions of this RFP and Vendor's Response Proposal become part of any ensuing agreement? (select one): Yes _____ No _____
19. Does your company agree to execute a contract containing the clauses shown in Section 00500 "Agreement between Contractor and Owner for Construction"? (select one): Yes _____ No _____

If "No", clearly note any exceptions to any information contained in the contract documents and include with your proposal. Otherwise, a "No" response without documentation will be considered a non-responsive proposal. In addition, any proposed exceptions may or may not be accepted by the University.

20. Does your company agree to comply with the University **Smoke and Tobacco Free Policies**? Yes _____ No _____

Note: Contractors submitting proposals for this project may, at the discretion of the University, be required to submit references including contact information to be used to assist in the post bid evaluation process for the subject project

ACKNOWLEDGEMENT OF MINIMUM QUALIFICATIONS:

The undersigned has read and understands the minimum qualifications for University construction projects, and has completed the Prequalification section completely and accurately. The undersigned understands that a contractor, who fails to meet the minimum qualifications **in the category identified for this project, will be disqualified from consideration for the project.**

ACCEPTANCE OF PROPOSAL:

The undersigned agrees to execute a Contract, being the Wayne State University standard form titled "Agreement Between Contractor and Owner for Construction" (see section 00500 of the bid documents), provided that we are notified of the acceptance of our Proposal within ninety (90) days of the date set for the opening thereof.

The undersigned below understands that the bid will be disqualified if the Prequalification information above is not completed in its entirety.

NAME OF COMPANY: _____

OFFICE ADDRESS: _____

PHONE NUMBER: _____ DATE _____

SIGNED BY: _____
Signature

(Please print or type name here)

TITLE _____

EMAIL ADDRESS: _____ @ _____

RESPONSIBLE CONTRACTOR POLICY (revised 12-12-2023)

1.0 Purpose

- 1.1 Wayne State University is committed to having responsible and ethical contractors and subcontractors on all of its construction projects, to ensure that work is performed by responsible, qualified firms that maintain the capacity, expertise, highly trained personnel, and other qualifications and resources necessary to successfully perform University projects in a safe, timely, reliable, high quality and cost-effective manner.
- 1.2 To achieve that goal, the University will require contractors and subcontractors submitting a bid on a construction project to provide information relating to their qualifications. The purpose of this policy is to assist the University in awarding contracts on every construction project to the lowest priced responsible bidder, or in the case of a major construction project using a criteria-based award, the responsible bidder who provides the best value to the University.

2.0 Definitions

- 2.1 A "major construction project" is a construction or other real property improvement or maintenance project whose planning and implementation require Board of Governors approval under Board Statute 2.81.01.090, "Capital Outlay".
- 2.2 The term "contractor" includes general contractors, trade contractors, construction managers, and design builders, as well as any subcontractors.

3.0 Policy

3.1 Contractor Qualifications

The University will obtain information from and about the contractors on its major construction projects. Depending on the extent of the University's prior experience with a contractor, that information may include:

- The contractor's experience on projects of similar size and complexity.
- References from other owners.
- The contractor's creditworthiness/financial condition.
- The contractor's and any subcontractor's safety records and prior history of OSHA/MIOSHA, environmental, or other regulatory violations, discrimination claims, criminal convictions, liens, compliance with applicable laws, and litigation (including arbitrations) with owners, contractors, subcontractors, unions, or employees.
- Qualifications of management and supervisory personnel to be assigned by the contractor to the project.
- Access to labor necessary for contract performance.

3.2 Contract Specifications

Contracts for the University's major construction projects will include terms requiring:

- Compliance with all applicable health, safety and environmental laws and regulations during performance of the contract, and timely provision to the University of copies of any complaint or allegation of a violation of any such regulation, and of any accident report, relating to work performed under the contract.
- Contractors and subcontractors to maintain and make available to the University, upon request, documentation of compliance with the University's Wage Rate Requirements

(University Policy 18-2) and/or other applicable wage rate requirements, including certified payroll reports and complete payroll records.

- Training for all workers assigned to perform work under the project, including any required OSHA/MIOSHA training.
- Registration of apprentices in bona fide training programs.
- Contractors and subcontractors to implement and take steps to enforce a requirement that workers on the project be drug and alcohol free on the job site.
- Promotion of work force and contractor diversity to the fullest degree permitted by law, including prohibition of illegal discrimination and violation of any applicable University policy regarding discrimination.
- Promotion of competition through small business development, by encouraging opportunities for qualified new and small businesses, including those owned by women and minorities, to participate in work under the contract, as contractors, subcontractors, and suppliers.
- Contractors and subcontractors to carry appropriate liability insurance in amounts established by the University's Enterprise Risk Management & Insurance Programs office; to comply with Michigan law on worker's compensation; to provide bid, payment, and performance bonds for the completion of the contracted work; and to maintain these coverages through the period specified by the Enterprise Risk Management & Insurance Programs office.
- Compliance with licensing requirements applicable to those assigned to perform work under the contract.

3.3 Work Force Management

On its major construction projects, the University will seek evidence that each successful contractor is able to furnish skilled tradespersons and laborers (a) in numbers sufficient to complete the work under the contract on a timely and cost effective basis, and (b) who are able to work in harmony with the employees of other contractors or subcontractors performing work on that project in order to achieve its completion on a timely and cost effective basis.

In that regard, the University will not discourage a contractor from entering into a project labor agreement (PLA) for a construction project at the University when the contractor determines that a PLA is allowable under applicable laws and will enhance its ability to perform the work on the project. Further, the Senior Vice President, Chief Financial Officer and Treasurer is authorized to require the successful contractor to enter into a PLA when doing so would advance the University's project-specific interests in cost savings, efficiency, timeliness, or quality and would promote the University's goals set forth in this policy. The Senior Vice President, Chief Financial Officer and Treasurer should not require a contractor to enter into a PLA on any project or part of a project when doing so would violate applicable laws or would unreasonably restrict competition in the contracting or subcontracting process..

WAYNE STATE UNIVERSITY RATE SCHEDULE (revised 11-01-2018)

POLICY

Wayne State University requires all project contractors, including subcontractors, who provide labor on University projects to compensate at a rate no less than WSU wage rates.

The rates of wages and fringe benefits to be paid to each class of laborers and mechanics by each VENDOR and subcontractor(s) (if any) shall be not less than the wage and fringe benefit rates prevailing in Wayne County, Michigan, as determined by the United States Secretary of Labor. Individually contracted labor commonly referred to as "1099 Workers" and subcontractors using 1099 workers are not acceptable for work on any of Wayne State's properties. Rates for all counties are available at <https://wdolhome.sam.gov/>, and Procurement will post the schedules quarterly that pertain to Wayne County on its website at <http://procurement.wayne.edu/vendors/wage-rates.php>.

Certified Payroll must be provided for each of the contractor's or subcontractor's payroll periods for work performed on any University project. Certified Payroll must accompany Pay Applications, and be fully reconciled with the final Pay Application. Failure to provide certified payroll will constitute a material breach of contract, and pay applications will be returned unpaid, and remain unpaid until satisfactory supporting documents are provided.

Additional information can be found on the University Procurement & Strategic Sourcing's web site at the following URL address: <http://procurement.wayne.edu/vendors/wage-rates.php>

PROCEDURE

Construction Bids and other Bids or Proposals for work that includes construction shall contain a WSU Wage Rate clause outlining a contractor's responsibilities under University policy. Each bid solicitation shall include reference to the most current wage determination schedule that contractors can use when preparing their bids.

When compensation will be paid under WSU Wage Rate requirements, the University shall require the following:

- The contractor shall obtain and keep an accurate record showing the name and occupation of and the actual wages and benefits paid to each laborer and mechanic employed in connection with this contract.
- The contractor shall submit a completed certified payroll document [U.S. Department of Labor Form WH 347] verifying and confirming the WSU Wage and benefits rates for all employees and subcontractors for each payroll period for work performed on this project. The certified payroll form can be downloaded from the Department of Labor website at <http://www.dol.gov/whd/forms/wh347.pdf>.
- A properly executed sworn statement is required from all tiers of contractors, sub-contractors and suppliers which provide services or product of \$10,000.00 or greater. Sworn statements must accompany applications for payment. All listed parties on a sworn statement as a subcontractor must submit Partial or Full Conditional Waivers for the amounts invoiced on the payment application. A copy of the acceptable WSU Sworn Statement and Waiver will be provided to the awarded contractor.

If the VENDOR or subcontractor fails to pay the WSU rates of wages and fringe benefits and does not cure such failure within 10 days after notice to do so by the UNIVERSITY, the UNIVERSITY shall have the right, at its option, to do any or all of the following:

- Withhold a portion of payments due the VENDOR as may be considered necessary by the UNIVERSITY to pay laborers and mechanics the difference between the rates of wages and fringe benefits required by this contract and the actual wages and fringe benefits paid.
- Terminate the contract and proceed to complete the contract by separate agreement with another vendor or otherwise, in which case the VENDOR and its sureties shall be liable to the UNIVERSITY for any excess costs incurred by the UNIVERSITY.

**C.S. Mott Lab Renovations
WSU Project No. 609-408429**

- Propose to the Associate Vice President for Business Services / Procurement that the Vendor be considered for Debarment in accordance with the University's Debarment Policy, found on our website at <https://policies.wayne.edu/appm/2-8-debarment-policy-on-non-responsible-vendor-in-procurement-transactions>

Terms identical or substantially similar to this section of this RFP shall be included in any contract or subcontract pertaining to this project.

Prior to award of the project, the apparent low bidder will be required to produce a schedule of values which will include the proposed subcontractors for each division of work and whether the subcontractor is signatory or non-signatory. A letter of intent or contract will not be issued to the apparent low bidder until this document is provided. The apparent low bidder will have one week to produce this document. If the required document is not received within this time, the bidder will be disqualified, and the next low bidder will be required to provide this schedule of values.

**APPENDIX A FOR THE
WSU WAGE SCHEDULE FOR THIS PROJECT**

See web site:

<http://go.wayne.edu/bids>

Key Performance Indicator Tracking Sworn Statement Requirements

The University tracks its level of spend along a number of socio-economic categories. This includes its spend with Diverse organizations, its spend with Detroit based organizations, and its spend with Michigan based organizations. To assist with this, The University has the following requirements for submission of your bid and for Pay Applications submitted by the successful contractor.

Submission of Bid

1. **Diverse or disadvantaged prime contractor:** Please specify in your bid whether ownership of your company is a certified diverse or disadvantaged business, according to the categories listed previously in section 00300. In accordance with guidelines from the MMSDC and GL-WBC, the University considers a business to be diverse when it is at least 51% owned, operated, and controlled by one or more members of a diverse classification. Section 00300 has a place for this information on page 00300-3.
2. **Detroit based and Michigan Based contractor:** It is presumed that the contractor is headquartered at the location we submit our Purchase Orders to, and that it should be the same address as listed in Section 00300 at the signature line. If a supplier is headquartered elsewhere, please make note of this information, so we do not inaccurately include or exclude spend.

Pay Applications and Sworn Statements

1. **Applicability:** The University requires Sworn Statements with Pay Applications for all construction projects that use
 - Subcontractors greater than \$10,000.00
 - Significant suppliers (those with a purchase value of \$10,000 or more).
2. **Sworn Statements:** The Supplier must submit applicable monthly sworn statements to the Project Manager and the Buyer of Record, in the format shown on page 2 of Section 00420. Sworn Statements are "always required" for this project, and are to be submitted to (**Project Manager**), the project manager, and to **Valerie Kreher, Senior Buyer**
3. **Inclusion:** Sworn Statements are to detail the inclusion of recognized diverse and disadvantaged groups in the following 2 categories; Subcontracts or Suppliers. The University recognizes the following groups as diverse or disadvantaged:
 - Minority Business Enterprises (MBE)
 - Women Business Enterprises (WBE)
 - Disabled Veteran Enterprises (DVBE)
 - Disabled Person Enterprises (DBE)
 - Veteran Owned Businesses (VBE)
 - Small Businesses per the US Small Business Administration (SBE)
- 1.
4. A complete set of the University's Supplier Diversity Program, which includes complete definitions of each of the above, can be downloaded from our web site at <http://policies.wayne.edu/administrative/04-02-supplier-diversity.php>.

**C.S. Mott Lab Renovations
WSU Project No. 609-408429**

STATE OF MICHIGAN Sworn Statement

COUNTY OF _____ } §

_____, being duly sworn, deposes and says that (s)he makes the Sworn Statement on behalf of _____, who is the Contractor for an improvement to the following described real property situated in _____ County, Michigan, and described as follows:

That the following is a statement of each subcontractor and supplier and laborer, for which laborer the payment of wages or fringe benefits and withholdings is due but unpaid, with whom _____ has subcontracted for performance under the contract with the Owner or lessee thereof, and that the amounts due to the persons as of the date thereof are correctly and fully set forth opposite their names, as follows. (Subcontracts or suppliers of values of less than \$1,000 are omitted.)

NO.	SUBCONTRACTOR (Name, Address, Telephone Number) SUPPLIER OR LABORER	S=Supplier C=Contractor	Type of Entity *see below	TYPE OF IMPROVEMENT FURNISHED	TOTAL CONTRACT PRICE	CONTRACT CHANGE +/-	ADJUSTED CONTRACT AMOUNT	AMOUNT PAID TO DATE	AMOUNT CURRENTLY OWING	BALANCE TO COMPLETE
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
TOTALS										

* Type of Entity: MBE=Minority Business Enterprises; WBE=Women Business Enterprises; DVBE=Disabled Veteran Enterprises; DBE=Disabled Person Enterprises; VBE=Veteran Owned Businesses;
SBE=Small Businesses per the US Small Business Administration

Please attach additional sheets if the number of items exceeds the page limit.

**C.S. Mott Lab Renovations
WSU Project No. 609-408429**

That _____ has not procured material from, or subcontracted with, any person other than those set forth above and owes no money for the improvement.

Deponent further says that _____ makes the foregoing statement as a representative of _____, for the purpose of representing to the owner or lessee of the above-described premises and his or her agents that the above-described property is free from claims of construction liens, or the possibility of construction liens, except as specifically set forth above and except for claims of construction liens by laborers which may be provided pursuant to section 109 of the construction lien act, Act No. 497 of the Public Acts of 1980, as amended, being section 570.1109 of the Michigan Compiled Laws.

Deponent Signature

WARNING TO OWNER: AN OWNER OR LESSEE OF THE ABOVE-DESCRIBED PROPERTY MAY NOT RELY ON THIS SWORN STATEMENT TO AVOID THE CLAIM OF A SUBCONTRACTOR, SUPPLIER, OR LABORER WHO HAS PROVIDED A NOTICE OF FURNISHING OR A LABORER WHO MAY PROVIDE A NOTICE OF FURNISHING PURSUANT TO SECTION 109 OF THE CONSTRUCTION LIEN ACT TO THE DESIGNEE IS NOT NAMED OR HAS DIED.

ON RECEIPT OF THIS SWORN STATEMENT, THE OWNER OF LESSEE, OR THE OWNER'S OR LESSEE'S DESIGNEE, MUST GIVE NOTICE OF ITS RECEIPT, EITHER IN WRITING, BY TELEPHONE, OR PERSONALLY, TO EACH SUBCONTRACTOR, SUPPLIER AND LABORER WHO HAS PROVIDED A NOTICE OF FURNISHING UNDER SECTION 109 OR, IF A NOTICE OF FURNISHING IS EXCUSED UNDER SECTION 108 OR 108A, TO EACH SUBCONTRACTOR, SUPPLIER OR LABORER WHO HAS PROVIDED A NOTICE OF FURNISHING OR WHO IS NAMED IN THE SWORN STATEMENT MAKES A REQUEST, THE OWNER, LESSEE, OR DESIGNEE SHALL PROVIDE THE REQUESTER A COPY OF THE SWORN STATEMENT WITHIN 10 BUSINESS DAYS AFTER RECEIVING THE REQUEST.

WARNING TO DEPONENT: A PERSON, WHO WITH INTENT TO DEFRAUD, GIVES A FALSE STATEMENT IS SUBJECT TO CRIMINAL PENALTIES AS PROVIDED IN SECTION 110 OF THE CONSTRUCTION LIEN, ACT, ACT NO. 497 OF THE PUBLIC ACTS OF 1980, AS AMENDED, BEING SECTION 570.2220 IF THE MICHIGAN COMPILED LAWS.

(NOTARY STAMP BELOW)

Subscribed and sworn to before me this _____ day of _____

Notary Public _____

_____ County, Michigan - My commission expires: _____

Rev.4 06.05.15

WAYNE STATE UNIVERSITY
PAYMENT PACKAGE DOCUMENT REQUIREMENTS (Revised 7-23-2015):

Review and comply with Section 410 of Bid Front End Documents.
Review and comply with Article 15 of the Supplemental General Conditions.

PAYMENT APPLICATION – PLEASE NOTE

- Each Pay Application is to be organized into the sections below; Payment Application, Sworn Statements, Certified Payroll, and Additional Supporting Documentation.
- These Documents are to be combined into a single PDF document, and is not to be combined with other Pay Applications.

PAYMENT APPLICATION - AIA document G702 & G703 (or equivalent) –Checklist:

- Correct Project Name – Found on your contract.
- Correct Project Number – Found on your contract.
- Purchase Order Number – Required prior to beginning work.
- Correct Application Number.
- Correct Period Reporting Dates – Applications support docs must be sequential and within application range.
- Approved & Executed Change Orders Listed. (Cannot invoice for unapproved Change Orders)
- Schedule of Values percentages and amounts match the approved Pencil Copy Review – Signed by the Architect, Contractor, and University Project Manager.
- Correct Dates – Back dating not accepted.
- Signed and Notarized.

SWORN STATEMENT – Checklist:

- List all contractors, sub-contractors, suppliers... ≥ \$10,000.00
- A sworn statement is required from every Sub Contractor on the job with a material purchase or sub-contract of \$10,000 or more. (All tiers.)
- Purchase Order Number
- Dates – Back dating not accepted.
- Signed and Notarized.

CERTIFIED PAYROLL - Dept. of Labor Form WH-347 – Checklist: (Union and Non-Union)

- For every contractor & sub-contractors work, for each week within the application reporting period.
- Correct Project Number
- List ALL workers on-site.
- Make sure their addresses are listed.
- Social Security Numbers MUST be blackened out or listed in XXX-XX-1234 format.
- Work classifications based on the job specific WSU Wage Schedule descriptions.
- For any workers paid at the Apprenticeship rates - proof of enrolled program and current completion required.
- Rate of Pay verified against the WSU Wage Schedule with an hourly cost breakdown of fringes paid.
- Authorized signatures on affidavit.
- Dates – must represent the weeks within the application period.

APPLICATION PACKAGE SUPPORTING DOCUMENTATION –

- **Proof of Ownership** for any 'Owner Operator' contractors not wishing to claim their time on WSU Wage.
– (Must list their hours and dates worked on the WH-347 Form and enter EXEMPT on the income

brackets.) The Owner must provide copies of "DBA" registration form confirming status as exempt from WSU Wage requirements.

- **Proof of Stored Materials** – Bill of Lading, Delivery Receipts, Pictures, Certificate of Insurance or endorsement pate specifically insuring stored material at location, and pictures with materials clearly separated and labeled for WSU. The University reserves the right to on site verification of stored materials.
- **Partial Conditional Waivers** – The contractor shall provide covering the entire amount of the application. For non-bonded projects all sub-contractors must provide for all applications which they have a draw.
- **Partial Unconditional Waivers** – Must release amount paid for work and be delivered starting with application #2 and in no case after payment application #3, through all sequential applications for contractors, sub-contractors, and suppliers listed on the Sworn Statements.
- **Full Unconditional Waivers** – Must be delivered with final payment application, releasing all contractors, sub-contractors, suppliers listed on the sworn statements and any legitimate notice of furnishings reconciled.

FINAL PAYMENT APPLICATION – Checklist:

- Clear and concise As-Built drawings.
- Operation and Maintenance Manuals
- Process and training directions (if applicable).
- Warranty of work in accordance with project documents.
- Submittals log and samples installed on the job.
- Certificate of Substantial Completion
- Full Unconditional Waiver

○

The Project Manager may provide additional requirements as may apply to individual jobs

Revised 11-01-2018

Contractor Performance Evaluation

In an effort to provide continuous process improvement regarding the construction of various university projects, Wayne State University is embarking upon a process of evaluating the contractor's overall performance following the completion of work. At the conclusion of the construction project a subjective evaluation of the Contractor's performance will be prepared by the Project Manager and the supervising Director of Construction. The evaluation instrument that will be used in this process is presented below:

We are providing the evaluation instrument at this time to allow the bidder's to review and understand the criterion that the University's project management team will use to evaluate the successful bidder's performance at the conclusion of the project. It is the intent of the university to utilize the results of this evaluation to determine if it will continue to conduct business with the Contractor in future bidding opportunities.

The scoring range is between 100 to 500 points, with 100 being low and 500 being high. Each question has an associated 'weight' factor, and the higher the weight; the greater the importance of satisfactory performance on the final score. At the conclusion of the project, and after the Project Manager and the supervising Director has prepared their independent evaluation, the University's project representative will meet with the Contractor to review the results. Acceptable contractor performance is essential to avoid having the University decline future work with the Contractor. An appeals process is available for Contractor disagreement with evaluation scores.

Contractors engaged in work are encouraged to maintain an open and regular dialog with the Design and Construction Department over the course of the construction project to ensure that the final evaluation is an accurate representation of the Contractor's performance.

CONSOLIDATED AGREEMENT FOR CONSTRUCTION GENERAL CONTRACTING

BOARD OF GOVERNORS OF WAYNE STATE UNIVERSITY
DETROIT, MICHIGAN

With

[GENERAL CONTRACTOR'S NAME]

For

[NAME PROJECT]

Wayne State University Contract Number [REDACTED]

This Agreement is entered into on [REDACTED], 20 [REDACTED], by and between the Board of Governors of Wayne State University, called "University" in this Agreement, and [CONTRACTOR NAME], called "Contractor" in this Agreement, to provide construction labor and materials as outlined in the Bid accepted [ENTER DATE HERE], attached to this Agreement as Exhibit A, for the Project described in this Agreement.

[ENTER A BRIEF DESCRIPTION OF THE PROJECT]

1.00 CONTRACT DOCUMENTS

The Contract Documents shall consist of this Agreement, the Contractor's Bid or Proposal attached to this Agreement as Exhibit A only insofar as consistent with the other Contract Documents, the General Conditions of Construction, the Supplementary General Conditions, the approved plans and specifications, and other documents listed in Article 11, Inclusion by Reference. In the case of conflicts between the Contractor's Bid and this Agreement or other Contract Documents, the language of this Agreement and the other Contract Documents shall prevail over the Contractor's Bid or Proposal.

2.00 DESIGN PROFESSIONAL

The Design Professional for this Project is:

[NAME]
[ADDRESS] |

The University intends that the relationship between the Contractor, Design Professional and University will be one of mutual cooperation and respect in order to promote efficiency and quality in the Project work.

3.00 CONTRACTOR'S RESPONSIBILITIES

3.01 Scope of Work

The Contractor shall furnish all labor, materials, equipment, project management and construction superintendent services necessary to construct the Work in accordance with the approved Contract Documents and executed Change Orders, including requirements reasonably inferable therefrom.

3.02 Skill and Judgment

The Contractor covenants with the University to furnish its best skill and judgment in furthering the interests of the University as defined in the Contract Documents. The Contractor shall perform all obligations under the Contract Documents using efficient business administration, superintendence and best efforts to facilitate the expeditious and timely completion of the Project consistent with the interests of the University as expressed in the Contract Documents. The Contractor acknowledges that significant effort will be invested in complying with the Contractor's Construction Schedule, and in maintaining construction quality. Accordingly, the Contractor further acknowledges that the greatest degree of professionalism is expected from the Contractor and the Design Professional in accomplishing their respective contractual obligations and that when potential conflicts exists, each shall demonstrate appropriate respect, professionalism and cooperation with each other in resolving such conflicts.

3.03 Scheduling

The Contractor shall develop a Contractor's Construction Schedule that clearly indicates the interrelationship of activities and defines the critical path of the entire Project. The Contractor shall submit a preliminary Contractor's Construction Schedule, by the earlier of fifteen (15) days from either the Notice to Proceed or the execution of this Agreement. The Contractor shall provide iterative updates to the Contractor's Construction Schedule with each Application for Payment, but no less than monthly. Upon request by the University, the Contractor shall prepare and submit a resource-loaded Contractor's Construction Schedule to the University and Design Professional for approval.

3.04 Construction

3.04.1 Subcontracts and Purchase Agreements

The Subcontracts shall be solely between the Contractor and the Subcontractors. Nothing in any Subcontract shall establish any contractual relationship between the University and any Subcontractor. However, the University is an intended third-party beneficiary of all Subcontracts, purchase orders and other agreements; the Contractor shall incorporate the obligations of the Contract Documents into its respective Subcontracts, supply agreements and purchase orders.

The Contractor will screen and pre-qualify, utilizing appropriate industry standards, potential Subcontractors for the Work keeping in mind the requirement to recruit and encourage Minority/Women Business Enterprise participation. The University shall have the right to review and approve all Subcontractors qualified or rejected for qualification by the Contractor. The Contractor shall notify the University of all Subcontractors to be used, and the Contractor shall remove any Subcontractor to which the University has an objection.

The Contractor shall obtain appropriate guarantees and warranties acceptable to the University from the Subcontractors, which shall be for the direct benefit of the University.

3.04.2 Construction Supervision

- a) The Contractor shall establish sufficient on-site organization, staffing and support as well as clear lines of authority in order to expeditiously complete the Project in accordance with the Contract Documents, in every aspect, on a totally coordinated basis.
- b) The Contractor shall maintain a competent full-time staff available at the site while Work is being performed to supervise, schedule and coordinate the performance of the Work of all Subcontractors in accordance with the University's objectives including cost, time for completion and quality of the Work. Contractor's Staffing Plan is attached as Exhibit D to this Agreement. The Staffing Plan shall not be changed, except with the written consent of the University's Representative unless members of the Project Staff cease to be in the employ of the Contractor.
- c) The Contractor shall notify the University of the dates, times and locations of conferences with Subcontractors and schedule and conduct regular progress meetings to be attended by all parties in interest including the University to discuss such matters as procedures, progress, job problems, scheduling, coordination, changes, and related matters.
- d) The Contractor shall take, transcribe and promptly distribute to all parties, including the University, minutes of such progress meetings with the Subcontractors, weekly job meetings and monthly management meetings.
- e) The Contractor shall maintain an on-site daily log of construction progress, problems and items of special interest. The Contractor shall provide digital photographic files and digital recording showing Project status or progress. Such logs, records, photographs and videos shall be immediately available to the University upon request.
- f) The Contractor shall furnish monthly written progress reports on the Subcontractors' work in a form acceptable to the University and assist the Design Professional and the University with periodic and final inspections of the Work. At all inspections preceding the final inspection, the Contractor shall furnish a detailed report to the University of observed discrepancies, deficiencies, and omissions in the Work performed by any Subcontractor.

- g) The Contractor shall provide and maintain a correct layout of the structures and monitor the Work to verify that all lines and levels are adhered to by the Subcontractors. The Contractor shall immediately report in writing all discrepancies with respect to design details for prompt resolution by the Design Professional.
- h) The Contractor shall submit any Request for Information (RFI) to the Design Professional and University only after attempting to determine if the requested clarification is contained in the Contract Documents; any RFI shall contain sufficient detail to allow a response within seven (7) calendar days of when the RFI is submitted. In no event shall the response to an RFI be considered delayed unless more than fourteen days have passed since the RFI was submitted.
- i) 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 Documents or that which is reasonably inferable for the completion of the Project.
- j) The Contractor shall be responsible to the University for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing any portion of the Work related to a contract with the Contractor.
- k) The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities of the University, Design Professional, or by tests, inspections or approvals required or performed by persons other than the Contractor, except where such relief is authorized by the University in writing in accordance with this Agreement.
- l) The Contractor shall inspect portions of Work performed or portions of existing facilities being renovated in this Project to determine that such portions are in proper condition to receive subsequent Work. Further, the Contractor shall plan for and call for the review of the Work by the University's commissioning agents as required. The Contractor's Construction Schedule shall include activities that recognize this coordination responsibility.

3.04.2.1 Safety

The Contractor shall protect adjoining property and nearby buildings, roads, and other facilities and improvements from dust, dirt, debris and other nuisances arising out of Contractor's operations or storing practices. Dust shall be controlled by sprinkling, negative pressure exhausting or other effective methods acceptable to University. Fugitive dust from interior demolition shall be controlled by negative pressure exhausting. An erosion and sedimentation control program shall be initiated, which includes measures addressing erosion caused by wind and water and sediment in runoff from site. A regular watering program shall be initiated to adequately control the amount of fugitive dust.

The Contractor is knowledgeable of and understands that the University may intend to maintain occupancy of certain portions of the existing facility. The Contractor shall exercise precaution at all times for the protection of persons and their property. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (1) employees on the Work and other persons who may be affected thereby; (2) the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's subcontractors or sub-subcontractors; and (3) other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall install adequate safety guards and protective devices for all equipment and machinery, whether used in the Work or permanently installed as part of the Project.

The Contractor shall also provide and adequately maintain all required means of egress, including but not limited to, proper temporary walks, roads, guards, railings, lights, and warning signs. The Contractor shall comply with all applicable laws relating to safety precautions. The Contractor shall establish, maintain and update a Project Specific Safety Program.

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

The Contractor shall require each and every one of its subcontractors and Trade subcontractors to comply with all of the provisions of this section.

The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

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

3.04.2.2 Hazardous Condition

The University and/or the Design Professional may bring to the attention of the Contractor a possible hazardous situation in the field regarding the safety of personnel on the site. The Contractor shall be responsible for verifying that all local, state, and federal workplace safety guidelines are being observed. In no case shall this right to notify the Contractor absolve the Contractor of its responsibility for monitoring safety conditions. Such notification shall not imply that anyone other than the Contractor has assumed any responsibility for field safety operations.

Explosives shall not be used without first obtaining written permission from the University and then shall be used only with the utmost care and within the limitations set in the written permission and in accordance with prudence and safety standards required by law. Storage of explosives on the Project site or University is prohibited. Powder activated tools are not explosive for purposes of this Article; however, such tools shall only be used in conformance with State safety regulations.

The Contractor shall immediately make a report to the University's Police Department and report in writing to the University's Representative, within eight (8) hours, all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or off the Site but on University property, which caused death, personal injury or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger. If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall report promptly the facts in writing to the University's Representative, giving full details of the claim.

3.04.2.3 University's Right to Stop the Work

If the Contractor fails to correct work which is not in accordance with the requirements of the Contract Documents as required, or persistently fails to carry out work in accordance with the Contract Documents, the University Representative, by written order may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the University to stop the Work shall not give rise to a duty on the part of the University to exercise this right for the benefit of the Contractor or any other person or entity.

It is understood that while the Contractor is fully responsible for the safety of the Work, and for the methods of its execution, if the University deems that the Contractor is failing to provide safe conditions, the University may stop the Work under such conditions. However, this ability shall not create such duty on the University. Under no circumstance shall the Contractor be granted a time extension or Contract Sum increase for conditions resulting by a stop work order.

3.04.2.4 University's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a three (3) day period after receipt of written notice from the University to commence and continue correction of such default or neglect with diligence and promptness, the University may after such three (3) day period, without prejudice to other remedies the University may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Design Professional's additional services and expenses made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the University.

3.04.3 Document Management

The Contractor shall maintain at the job site, on a current basis, all Project documents including plans, specifications, shop drawings, samples, submittal, purchase orders, Subcontracts, material specifications, and any other related documents, and revisions thereto, which arise out of or relate to the Project, this Agreement or the Work. Prior to final payment, copies of all such records shall be provided to the University.

The Contractor shall be responsible for reviewing, processing and paying applications by Subcontractors for progress and final payment. The University will compensate the Contractor monthly based on the requirements of Article 4.04, Application For Payment.

The Contractor shall prepare and submit to the University every three months a report of the total M/WBE participation in the Project to demonstrate compliance with Paragraph 3.04.6 together with a projection of M/WBE participation through Final Completion.

3.04.3.1 Review of Contract Documents and Field Conditions by Contractor

Execution of the Contract by the Contractor is a representation that the Contractor shall have thoroughly and carefully examined the site of the of Work; investigated any and all conditions which can affect the Work or its cost, including but not limited to, availability of labor, materials, supplies, water, electrical power, roads, access to the site, University episodic and scheduled closures, uncertainties of weather, water tables, the character of equipment and facilities needed to perform the Work, and local conditions under which the Work is to be performed; and further, that the Contractor shall insure that the documents issued for bidding by Trade Contractors reflect the results of this investigation and are adequate to complete the Work. It is the responsibility of the Contractor to be familiar with the materials, equipment, or procedures to be used in the Work, or which in any other way could affect the completion of the Work. Any failure to properly familiarize themselves with the proposed Work shall not relieve the Contractor from the responsibility for completing the Work in accordance with the Contract Documents.

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Project. Contract Documents are complementary, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to be consistent with the Contract Documents and the highest standard of care. In the case of an inconsistency between, or perceived omission or error in the Drawings, Specifications, or other Contract Documents which is not clarified by addendum or RFI, or should the Contractor be in doubt as to their exact meaning, the Contractor shall notify

the Design Professional and the University prior to performing any related Work. The University shall not be responsible for the Contractor's misinterpretations of Drawings and Specifications and/or other Contract Documents.

The Contractor shall have a continuing duty to read, carefully study and compare the Contract Documents and product data with each other and with information furnished by the University, and shall at once report to the Design Professional and the University errors, inconsistencies, ambiguities and omissions before proceeding with the affected Work. The Contractor shall be liable to the University for damage resulting from errors, inconsistencies or omissions in the Contract Documents, relating to constructability if the Contractor recognized or should have recognized such error, inconsistency, ambiguity or omission and failed to report it to the Design Professional and the University. If the Contractor performs any construction activity which involves such error, inconsistency, ambiguity or omission in the Contract Documents relating to constructability, without such notice to the Design Professional and the University, the Contractor shall assume responsibility for such performance and shall bear all costs attributable for correction. If the Contractor submits authorized substitutes that cost in excess of the Contract Sum which cause coordination conflicts, the Contractor shall bear all costs attributable to correction.

The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Design Professional prior to performing any affected Work.

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

3.04.4 Cash Flow Estimates and Cost Control

At the University's request, the Contractor shall prepare a Cash Flow Estimate indicating the anticipated schedule of payment application amounts within fifteen (15) days after the Contractor's Bid has been accepted. The Cash Flow Estimate shall be revised periodically, at least every three months, unless significant deviations are expected or otherwise more frequently as requested by the University.

The Contractor shall review requests for changes with the University, and with the University's approval, obtain quotations from affected Subcontractors. Bulletins to Subcontractors shall define the scope of the change and require pricing using either lump sum, time and materials or cost of Work for all items of Work, including overhead and profit as may be defined in the Bid and this Agreement and shall include costs related to schedule delays, if applicable. Where both additions and deductions are involved, each should be calculated separately. Contractor shall be responsible for reviewing the pricing submitted by Subcontractors for accuracy, completeness, and reasonableness.

3.04.5 Minority/Women Business Enterprise Participation

The University makes a continuous effort to strongly encourage Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) contractors and supplier to bid on and participate in University contracts. To the fullest extent permitted under federal and Michigan law, you are strongly encouraged to retain the services of WBE and MBE Subcontractors and suppliers of goods and services in connection with performance of this Contract. For purposes of this Contract, MBE is defined as a business entity in which 51% or minority individuals hold more of the voting shares and interest in the enterprise. The minority ownership of the enterprise shall have management and investment control of the company. WBE is defined as a business entity in which 51% or a woman or women hold more of the voting shares and interest in the enterprise. The female ownership of the enterprise shall have management and investment control of the company.

3.04.7 Time of Completion

The Contractor acknowledges that time is of the essence in performing and completing the Work on the Project. Accordingly, the Contractor shall comply with the activity and milestone completion dates as defined in the Contractor's Construction Schedule as mutually agreed by the Contractor, the University and the Design Professional. The Contractor shall provide, prepare and/or participate in developing schedules, submittals, shop drawings, construction schedules, close out documents, or other activities consistent with the conditions of the Contract Documents and as set forth below:

- A. Substantial Completion: [ENTER COMPLETION DATE]
- B. Punchlist Completion: [ENTER COMPLETION DATE]
- C. Final Completion: [ENTER COMPLETION DATE]

3.04.8 Timely Completion

Contractor acknowledges that the University has scheduled use of the Project immediately following the Dates of Substantial Completion. In scheduling that use, the University may have signed contracts and otherwise made financial commitments relating to the use of the Project no later than the date of Substantial Completion. In the event that the Contractor fails to complete on or before the date for Substantial Completion, the Contractor shall be responsible to reimburse the University for all direct, indirect and administrative costs and expenses incurred in locating, coordinating and securing alternate sites, refunding deposits, and taking any other reasonable action as a consequence of the Contractor's failure to achieve Substantial Completion by the date stated in this Agreement.

The University shall be entitled to retain from the Contractor those damages incurred upon the Contractor's default of Substantial Completion, as provided above.

The Contractor further agrees to complete 100% of all punchlist items, documented on the Substantial Completion certificate, within forty-five (45) days of the date of Substantial Completion. Nothing in this Article 3.04.08 shall be construed as a limitation or waiver on such other rights as the University may have.

3.04.8.1 Substantial Completion

"Substantial Completion" shall mean the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the University can occupy or utilize the Work for its intended use. Substantial Completion shall only be determined as described in the Contract Documents.

3.04.8.2 Final Completion

"Final Completion" means the completion of all the Work in accordance with the Contract Documents and the acceptance thereof by the University. Completion of the Work includes (1) full performance of all Contract terms; (2) acceptance of the Work by University; (3) resolution of all outstanding Changes of Contract; (4) completion of all "punch-list" items; and (5) delivery of all Close-out Documents.

3.05 Contractor's Insurance

The Contractor shall not commence Work under this Contract until it has obtained all the insurance required by the Contract Documents and such insurance has been approved by the University; likewise, no subcontractor or subconsultant shall be allowed to commence Work until the insurance required has been

obtained. The Contractor shall, at its expense, purchase and maintain in full force and effect such insurance as will protect itself and the University from claims, such as for bodily injury, death, and property damage, which may arise out of or result from the Work required by the Contract Documents, whether such Work is done by the Contractor, by any subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. The types of such insurance and any additional insurance requirements are specified herein with the amounts and limits set forth in the Supplementary General Conditions.

3.05.1 Policies and Coverage

The following policies and coverages shall be furnished by the Contractor promptly upon request by the University:

(1) Comprehensive or Commercial Form General Liability Insurance covering all Work done by or on behalf of the Contractor and providing insurance for bodily injury, personal injury, property damage, and Contractual liability. Except with respect to bodily injury and property damage included within the products and completed operations hazards, the aggregate limit shall apply separately to work required of the Contractor by these Contract Documents. This insurance shall include the contractual obligations assumed under the Contract Documents and specifically section 4.06.

(2) Business Automobile Liability Insurance on an "Occurrence" form covering owned, hired, leased, and non-owned automobiles used by or on behalf of the Contractor and providing insurance for bodily injury, property damage, and Contractual liability.

(3) Worker's Compensation and Employer's Liability Insurance as required by Federal and Michigan law. The Contractor shall also require all of its Subcontractors to maintain this insurance coverage.

(4) The Umbrella Excess Liability insurance must be consistent with and follow the form of the primary policies, except that Umbrella Excess Liability insurance shall not be required for the Medical Expense Limit.

(5) Builder's Risk Insurance.

(6) Professional Liability Insurance (Errors and Omissions).

3.05.2 Proof of Coverage

Certificates of Insurance, or other evidence of the insurance required by these Contract Documents or requested by the University, shall be submitted by the Contractor to the University. The Certificates of Insurance shall state the scope of coverage and deductible, identify any endorsements to the policies and list the University as an additional named insured. Any deductible shall be the Contractor's liability. The Certificates of Insurance shall provide for no cancellation or modification of coverage without thirty (30) days prior written notice to the University. Acceptance of Certificates of Insurance by the University shall not in any way limit the Contractor's liabilities under the Contract Documents. In the event the Contractor does not comply with these insurance requirements, the University may, at its option, provide insurance coverage to protect the University; the cost of such insurance shall be deducted from the Contract Sum or otherwise paid by the Contractor. Renewal certifications shall be filed in a timely manner for all coverage until the Project is accepted as complete. Upon the University's request, the Contractor shall provide copies of the policies obtained from the insurers.

3.05.3 Subcontractor's Insurance

The Contractor shall either require subcontractors to carry the insurance or the Contractor shall insure the activities of the subcontractors in the amount, types and form of insurance required by the Contract

Documents. If the Contractor elects to have its subcontractors purchase individual insurance policies, the Contractor's subcontracts shall include a clause requiring that copies of any insurance policies which provide coverage to the Work shall be furnished to the University. The Contractor shall supply the University with a list of all subcontractors showing whether or not they have individual insurance policies and certifying that those subcontractors without individual insurance policies are insured by the Contractor.

3.05.4 Scope of Insurance Coverage

The Contractor's insurance as required by the Contract Documents (including subcontractors' insurance), by endorsement to the policies and the Certificates of Insurance, shall include the following and may be presented in the form of a rider attached to the Certificates of Insurance:

(1) The Board of Governors of Wayne State University, the University, their officers, employees, representatives and agents including the Design Professional, shall be included as additional named insureds for and relating to the Work to be performed by the Contractor and subcontractors. This shall apply to all claims, costs, injuries, or damages.

(2) A Severability of Interest Clause stating that, "The term 'insured' is hereby used severally and not collectively, but the inclusion herein of more than one insured shall not operate to increase the limits of the insurer's or insurers' liability."

(3) A Cross Liability Clause stating that, "In the event of claims being made under any of the coverages of the policy or policies referred to herein by one or more insured hereunder for which another or other insured hereunder may be liable, then the policy or policies shall cover such insured or insured against whom a claim is made or may be made in the same manner as if separate policies had been issued to each insured hereunder. Nothing contained herein, however, shall operate to increase the insurer's limits of liability as set forth in the insuring agreements."

(4) The Board of Governors of Wayne State University, the University, their officers, employees, representatives and agents, shall not by reason of their inclusion as insured incur liability to the insurance carriers for payment of premiums for such insurance. However, the Board of Governors of Wayne State University may, in their sole discretion after receiving a notice of cancellation for nonpayment, elect to pay the premium due and deduct such payment from any sums due to the Contractor or recover the amount paid from the Contractor if the sums remaining are insufficient.

(5) Coverage provided is primary and is not in excess of or contributing with any insurance or self-insurance maintained by the Board of Governors of Wayne State University, the University, their officers, employees, representatives and agents.

3.05.5 Miscellaneous Insurance Provisions

The form and substance of all insurance policies required to be obtained by the Contractor shall be subject to approval by the University. All such policies shall be issued by companies lawfully authorized to do business in Michigan and be acceptable to the University. All property insurance policies to be obtained by the Contractor shall name the University as loss payee as its interest, from time to time, may appear.

The Contractor shall, by mutual agreement with the University and at the University's cost, furnish any additional insurance as may be required by the University. The Contractor shall provide appropriate endorsements evidencing such additional insurance.

In the event that the scope of Work includes asbestos abatement, the Contractor or subcontractor, as appropriate, shall provide \$1,000,000 asbestos liability insurance.

The University is not required to provide or purchase any additional insurance with respect to this Project or the Work required of the Contractor for the Project.

3.05.6 Loss Adjustment

Any insured loss is to be adjusted with the University and made payable jointly to the University and the Contractor. The Contractor shall cooperate with the University in a determination of the actual cash value or replacement value of any insured loss. Any deductible amount shall be the responsibility of the Contractor to resolve.

3.05.7 Compensation Distribution

The University upon the occurrence of an insured loss shall account for any money so received and shall distribute it in accordance with such agreement as the interested parties may reach. Claim payments received shall be distributed proportionately according to the actual percentages of losses to both. If after such loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate contract change order. Any dispute shall be resolved by the University.

3.05.8 No Waiver of Subrogation

The University does not waive any rights of Subrogation that it may possess on this Project.

3.06 Indemnification

3.06.1

To the fullest extent permitted by law, the Contractor shall hold harmless, defend, and indemnify the Board of Governors of Wayne State University, the University, and officers, employees, representatives and agents of each of them, from and against any and all claims or losses arising out of or are alleged to be resulting from, or relating to (1) the failure of the Contractor to perform its obligations under the Contract or the performance of its obligation in a willful or negligent manner; (2) the inaccuracy of any representation or warranty by the Contractor given in accordance with or contained in the Contract Documents; and (3) any claim of damage or loss by any subcontractor, or supplier, or laborer against the University arising out of any alleged act or omission of the Contractor or any other subcontractor, or anyone directly or indirectly employed by the Contractor or any subcontractor.

3.06.2

To the fullest extent permitted by law, the Contractor shall be liable for and hereby agrees to defend, discharge, fully indemnify and hold the University harmless from and against any and all claims, demands, damages, liability, actions, causes of action, losses, judgments, costs and expenses of every nature (including investigation costs and/or expenses, settlement costs, and attorney fees and expenses incident thereto) sustained by or asserted against the University arising out of, resulting from, or attributable to the performance or nonperformance of any Work and/or obligation covered by the Contract or to be undertaken in connection with the construction of the Project contemplated by the Contract (collectively, "Claim"), including, but not limited to, any Claim for: (a) any personal or bodily injury, illness or disease, including death at any time resulting therefrom of any person, (including, but not limited to, employees of the University, the Contractor, any subcontractor, and any materialman and the general public); (b) any loss, damage or destruction of any property; (c) any loss or damage to the University's operations, arising out of, resulting from, or attributable in whole or in part to (i) any negligence or other act or omission of the Contractor, and any subcontractor, any materialman and/or any other person or any of the directors, officers, employees or agents of any of them or (ii) any defects in material or equipment furnished hereunder; (d) any payments allegedly owed to subcontractors, sub-subcontractors or materialmen; (e) any acts or omissions relative to

conditions of safety and protection of persons on the Project site; and/or (f) any act or omission relative to the Contractor's breach of obligations and regarding non-discrimination as set forth in these General Conditions. The Contractor shall not be liable hereunder to indemnify the University against liability for damages arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence or willful misconduct of the University, its agents or employees. The Contractor, at its own cost and expense, shall take out and maintain at all times during the effective period of the Contract, contractual liability insurance insuring the performance by the Contractor of its contractual duties and obligations under this Article, which insurance shall name the University as additional insured and shall be in form and amount and from an insurance company satisfactory to the University. The Contractor's duty to fully indemnify the University shall not be limited in any way by the existence of this insurance coverage.

3.06.3

The Contractor shall also be liable for and hereby agrees to pay, reimburse, fully indemnify and hold the University harmless from and against all costs and expenses of every nature (including attorney fees and expenses incident thereto) incurred by the University in collecting the amounts due from the Contractor, or otherwise enforcing its rights, under the indemnifications described in this Article.

3.06.4

In claims against any person or entity indemnified under this Article made by an employee of the Contractor or a Subcontractor, supplier or indirectly employed by any of them, or anyone for whose acts is made liable, the indemnification obligation under this Article shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor, Subcontractor or supplier under workers compensation laws, disability benefit laws, or other laws providing employee benefits.

3.06.5

The indemnification obligations under this Article shall not be limited by any assertion or finding that the person or entity indemnified is liable by reason of a non-delegable duty.

3.06.6

The Contractor shall hold harmless, defend, and indemnify the University from and against losses resulting from any claim of damage made by any separate contractor of the University against the University arising out of any alleged acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by either the Contractor or subcontractor, or anyone for whose acts either the Contractor or subcontractor may be liable.

3.06.7

The Contractor shall hold harmless, defend, and indemnify the separate Contractors of the University from and against losses arising out of the negligent acts or omissions or willful misconduct of the Contractor, a subcontractor, anyone directly or indirectly employed by the Contractor or subcontractor, or anyone for whose acts the Contractor or subcontractor may be liable.

3.07 Guarantee

The Contractor unconditionally guarantees the Work under this Contract to be in conformance with the Contract Documents and to be and remain free of defects in workmanship and materials not inherent in the quality required or permitted. Contractor shall repair or replace any Work, together with any adjacent Work which may be displaced in so doing, which is not in accordance with the requirements of the Contract or which is defective in its workmanship or material, all without any expense whatsoever to the University for a

period of **one (1) year / two (2) years** from the date of Substantial Completion, unless a longer guarantee period is stipulated in the Contract Documents or otherwise available from the manufacturer ("Repair Period").to.

Special guarantees that are required by the Contract Documents shall be signed by the Contractor who is responsible for the entire work and countersigned by the subcontractor who performs the work.

The Contractor further agrees that within five calendar days after being notified in writing by the University of any Work not in accordance with the requirements of the Contract Documents or of any defects in the Work, it shall commence and prosecute with due diligence all Work necessary to fulfill the terms of this guarantee and to complete the Work in accordance with the requirements of the Contract with sufficient manpower and material to complete the repairs as expeditiously as possible. The Contractor, in the event of failure to so comply, does hereby authorize the University to proceed to have the Work done at the Contractor's expense, and it agrees to pay the cost thereof upon demand. The University shall be entitled to all costs necessarily incurred upon the Contractor's refusal to pay the above cost.

Notwithstanding the foregoing paragraph, in the event of an emergency constituting an immediate hazard to health, safety or damage of the University's employees, property, or licenses, the University may undertake at the Contractor's expense, without prior notice, all Work necessary to correct such hazardous conditions caused by the Work of the Contractor not being in accordance with the requirements of this Contract.

The Contractor shall require a similar guarantee in all subcontracts, including the requirement that the University be reimbursed for any damage or loss to the Work or to other Work resulting from such defects.

If required by the Contract Documents, the Maintenance and Guarantee Bond shall be in full force and effect during the entire Repair Period, unless a longer bond period is stipulated in the Contract Documents.

4.00 CONTRACTOR'S COMPENSATION

4.01 Basis of Compensation

In consideration of the full performance of this Agreement by the Contractor, the University shall compensate the Contractor as stated in **Exhibit B**.

4.02 Change Orders and Construction Change Directives

4.02.1 Generally

The University reserves the right to issue written orders whether through a formal Change Order or Construction Change Directive, directing changes in the Contract at any time prior to the acceptance of the Project without voiding the Contract, and Contractor shall promptly comply with such order. A Construction Change Directive may be issued in writing by the University directing the Contractor to perform changed Work in the absence of a final agreement on a Change Order and the costs will be calculated as provided in 6.01.4. The Contractor may request changes in the Work, but shall not act on the changes until approved in writing by the University. Any change made without authority in writing from the University shall be the responsibility of the Contractor.

Any such changes in the Work that have a cost impact shall only be authorized by Change Orders approved by the University. No action, conduct, omission, prior failure or course of dealing by the University shall act to waive, modify, change or alter the requirement that Change Orders must be in writing and signed by the University and Contractor and that such written Change Orders are the exclusive method for changing or altering the Contract Sum or Contract Time. The University and Contractor understand and agree that the Contract Sum and Contract Time cannot be changed by implication, oral agreements, actions, inaction, course of conduct or Construction Change Directive.

On the basis set forth herein, the Contract Sum may be adjusted for any Change Order requiring a different quantity or quality of labor, materials or equipment from that originally required, and the partial payments to the Contractor, set forth in section 8.01, may be adjusted to reflect the change. Whenever the necessity for a change arises, the Contractor shall take all necessary steps to mitigate the effect of the ultimate change on the other Work in the area of the change. Changed Work shall be performed in accordance with the original Contract requirements except as modified by the Change Order. Except as herein provided, the Contractor shall have no claim for any other compensation including lost productivity or increased overhead expenses due to changes in the Work. The amounts set forth in the Change Order constitute full compensation for both direct and indirect costs of the Work described in the Change Order. Payment by the University pursuant to the Change Order shall constitute full satisfaction of any and all claims for compensation and extension of time by the Contractor for the performance of the Work by the Contractor and all subcontractors.

4.02.2 Proposed Change Orders

The Design Professional, with approval of the University, shall issue to the Contractor a cost request Bulletin for a proposed change order describing the intended change and shall require the Contractor to indicate thereon a proposed amount to be added to or subtracted from the Contract Sum due to the change supported by a detailed estimate of cost. Upon request by the University, the Contractor shall permit inspection of the original Contract estimate, subcontract agreements, or purchase orders relating to the change. Any request for adjustment in Contract Time which is directly attributable to the changed Work shall be included with substantiating detailed explanation by the Contractor in its response to the cost request bulletin. Failure by Contractor to request adjustment of Contract Time in the response to the cost request Bulletin shall waive any right to subsequently claim an adjustment of the Contract Time based on the changed Work. The Contractor shall submit the response to the cost request Bulletin with detailed estimates and any time extension request thereon to the Design Professional and the University's Representative within ten (10) calendar days after issuance of the cost request bulletin. Upon its submission the Design Professional will review it and advise the University who will make the decision. If the Contractor fails to submit the response within the required ten (10) calendar days, and the Contractor has not obtained the Design Professional's and the University's permission for a delay in submission, the University may order the Contractor in writing to begin the Work immediately, and the Contract Sum shall be adjusted in accordance with the University's estimate of cost. In that event, the Contractor, within fifteen days following completion of the changed Work, may present information to the University that the University's estimate was in error; the University, in its sole discretion, may adjust the Contract Sum. The Contractor must keep and submit to the University time and materials records verified by the University to substantiate its costs. The University may require the Contractor to proceed immediately with the changed Work in accordance with section 4.02.4, "Failure to Agree as to Cost" or section 4.02.6 "Emergency Changes."

When the University and the Contractor agree on the amount to be added to or deducted from the Contract Sum and the time to be added to or deducted from the Contract Time and an Impact Report or a Contract Change Order is signed by the University and the Contractor, the Contractor shall proceed with the changed Work. If agreement is reached as to the adjustment in compensation for the performance of changed Work but agreement is not reached as to the time adjustment for such Work, the Contractor shall proceed with the Work at the agreed price, reserving the right to further pursue its Claim for a time adjustment. Any costs incurred to acquire information relative to a proposed Change Order shall not be borne by the University.

4.02.3 Allowable Costs Upon Change Orders

The only estimated or actual costs that will be allowed because of changed Work and the manner in which those costs shall be computed is described by this section.

4.02.3.1 Labor

Costs are allowed for the actual payroll cost to the Contractor for direct labor, engineering or technical services directly required for the performance of the changed Work, (but not site management such as field office estimating, clerical, project engineering, management or supervision) including payments, assessments, or benefits required by lawful labor union collective bargaining agreements, compensation insurance payments, contributions made to the State pursuant to the Unemployment Insurance Code, and for taxes paid to the federal government required by the Social Security Act of August 14, 1935, as amended, unless the time of completion adjustments affect the general condition inclusion of the Contract Sum.

No labor cost will be recognized at a rate in excess of the appropriate wage rates established for that portion of the Work, nor will the use of a classification which would increase the labor cost be permitted unless the Contractor established to the satisfaction of the University the necessity for payment at a higher rate.

4.02.3.2 Materials

Costs are allowed for the actual cost to the Contractor for the materials directly required for the performance of the changed Work. Such cost of materials may include the costs of transportation, sales tax, and delivery if necessarily incurred. However, overhead costs shall not be included. If a trade discount by the actual supplier is available to the Contractor, it shall be credited to the University. If the materials are obtained from a supply or source owned wholly or in part by the Contractor, payment therefor will not exceed the current wholesale price for such materials.

If, in the opinion of the University, the cost of materials is excessive, or if the Contractor fails to furnish satisfactory evidence of the cost from the actual suppliers thereof, then in either case the cost of the materials shall be deemed to be the lowest wholesale price at which similar materials are available in the quantities required at the time they were needed.

4.02.3.3 Equipment

Costs are allowed for the actual cost to the Contractor for the use of equipment directly required in the performance of the changed Work except that no payment will be made for time while equipment is inoperative due to breakdowns or for non-working days. The rental time shall include the time required to move the equipment to the Project site from the nearest available source for rental of such equipment, and to return it to the source. If such equipment is not moved by its own power, then loading and transportation costs will be paid. However, neither moving time nor loading and transportation costs will be paid if the equipment is used on the Project in any other way than upon the changed Work. Individual pieces of equipment having a replacement value of \$500.00 or less shall be considered to be tools or small equipment, and no payment therefor will be made.

For equipment owned or furnished by the Contractor, no cost therefor shall be recognized in excess of the rental rates established by distributors or equipment rental agencies in the locality where the Work is performed. Blue Book rates shall not be used for any purpose.

The amount to be paid to the Contractor for the use of equipment as set forth above shall constitute full compensation to the Contractor for the cost of fuel, power, oil, lubrication, supplies, small tools, small equipment, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor (except for equipment operators who shall be paid for as provided in Article 4.02.3.1) and any and all costs to the Contractor incidental to the use of such equipment.

4.02.3.4 Work by Subcontractors and Vendors

For any portion of the changed Work which is to be performed by a subcontractor, the Contractor shall furnish to the University a detailed estimate prepared and signed by subcontractor of the cost to subcontractor for performing the changed Work. At the sole discretion of the University, a lump sum estimate of such cost to

subcontractor may be accepted in lieu of the detailed estimate. The combined costs for subcontractor's overhead, profit, taxes, indirect supervision, insurance, bonds shall not exceed ten percent (10%). Estimates of the amount to be deleted from subcontractor's portion of the Work shall be gross cost of the deducted Work plus eight percent (8%). For changed Work to be furnished by a supplier, the Contractor shall furnish upon demand of the University, a lump sum estimate of the cost of the items including taxes and cartage to the Contractor prepared by the supplier. No supplier mark-up for overhead, profit, layout, supervision or bonds will be allowed for changed Work furnished by a supplier.

4.02.3.5 Contractor Mark-up for Added Work

Where changed Work is performed, the Contractor may add to the total estimated actual cost for such Work no more than ten (10%) for subcontractor mark-up and seven and one-half percent (7.5%) for self-performed trade work for profit, overhead, insurance, taxes, indirect supervision, bonds, and any other costs not allowed by section 4.02.01.

4.02.3.6 Credit for Deleted Work

The amount to be deducted from the Contract Sum shall be the total estimated actual cost of the deducted Work plus eight percent (8%).

Where an entire item or section of Work is deleted from the Contract, the entire subcontract cost or bid cost shall be considered the appropriate deduction less the value of Work performed. If the subcontract cost or bid cost is not identifiable, then estimates of the amount to be deducted from the Contract Sum shall be the gross cost of the deducted work plus six percent (6%) for saved overhead, bonds, insurance, and taxes.

For proposed change orders which involve both added and deleted Work, the Contractor shall separately estimate the cost of the added Work before mark-ups, and separately estimate the cost of the deleted Work before allowance of a credit. If the difference between the costs results in an increase to the Contract Sum, the mark-up for added Work shall be applied to the difference, and if the difference in the costs results in a decrease, then the mark-up for deleted Work shall be applied to the difference.

4.02.3.7 Market Values

Cost for added Work shall be no more than market values prevailing at the time of the change, unless the Contractor can establish to the satisfaction of the University that it investigated all possible means of obtaining Work at prevailing market values and that the excess cost could not be avoided.

When a change order deletes Work from the Contract, the computation of the cost thereof shall be the values which prevailed at the time bids for the Work were opened or the Contract Sum established.

4.02.4 Failure to Agree as to Cost

4.02.4.1 For Added Work

Notwithstanding the failure of the University and the Contractor to agree as to the cost of the proposed Change Order, the Contractor, upon written order from the University, shall proceed immediately with the changed Work. A Construction Change Directive or letter signed by the University shall be used for this written order. At the start of each day's Work on the change, the Contractor shall notify the University in writing as to the size of the labor force to be used for the changed Work and its location. Failure to so notify may result in the non-acceptance of the costs for that day. At the completion of each day's Work, the Contractor shall furnish to the University a detailed summary of all labor, materials, and equipment employed in the changed Work. The University will compare his/her records with Contractor's daily summary and may make any necessary adjustments to the summary. After the University and the Contractor agree upon and

sign the daily summary, the summary shall become the basis for determining costs for the additional Work. The sum of these costs when added to an appropriate mark-up will constitute the payment for the changed Work. Subsequent adjustments, however, may be made based on later audits by the University. When changed Work is performed at locations away from the job site, the Contractor shall furnish in lieu of the daily summary, a summary submitted at the completion of the Work containing a detailed statement of labor, material, and equipment used in the Work. This latter summary shall be signed by the Contractor who shall certify thereon that the information is true.

The Contractor shall maintain and furnish on demand of the University itemized statements of cost from all vendors and subcontractors who perform changed Work or furnish materials and equipment for such Work. All statements must be signed by the vendors and the subcontractors.

4.02.4.2 For Deleted Work

When a proposed Change Order contains a deletion of any Work, and the University and the Contractor are unable to agree upon the cost thereof, the University's estimate shall be deducted from the Contract Sum and may be withheld from any payment due the Contractor until the Contractor presents adequate substantial information to the University that the University's estimate was in error. The amount to be deducted shall be the actual costs to the Contractor for labor, materials, and equipment which would have been used on the deleted Work together with an amount for mark-up as defined in the Contract Documents.

4.02.5 Allowable Time Extensions

For any change in the Work, the Contractor shall only be entitled to such adjustments in Contract Time due solely to performance of the changed Work. The procedure for obtaining an extension of time is set forth in Section 4.08 of these General Conditions. No extension of time shall be granted for a change in the Work unless the Contractor demonstrates to the satisfaction of the University that the Work is on the critical path and submits an updated CPM schedule showing that an extension of time is required and that the Contractor is making, or has made, every reasonable effort to guarantee completion of the additional Work called for by the change within the time originally allotted for the Contract. Failure by the Contractor to make the required submission or showing constitutes a waiver of any possible adjustment in Contract Time.

Any adjustment in Contract time shall specify the exact calendar day.

4.02.6 Emergency Changes

Changes in the Work made necessary due to unforeseen site conditions, discovery of errors in plans or specifications requiring immediate clarification in order to avoid a serious Work stoppage, changes of a kind where the extent cannot be determined until completed, or under any circumstances whatsoever when deemed necessary by the University are kinds of emergency changes which may be authorized by the University in writing to the Contractor. The Contractor shall commence performance of the emergency change immediately upon receipt of written direction from the University.

If agreement is reached as to compensation adjustment for the purpose of any emergency change, then compensation will be as provided in this section relating to ordinary changes. If agreement is not reached as to compensation at the time of commencing the emergency change, then compensation will be as provided in section 4.02.4, that is, time and materials records and summaries shall be witnessed and maintained until either a lump sum payment is agreed upon, or the changed Work is completed.

4.03 Records and Audit

4.03.1

Contractor's records, which shall include but not be limited to accounting records (hard copy, as well as computer readable data if it can be made available), written policies and procedures; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets, correspondence; change order files (including documentation covering negotiated settlements); backcharge logs and supporting documentation; general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends; and any other supporting evidence deemed necessary by the University to substantiate changes related to the Agreement (collectively referred to as "Records") shall be maintained in accordance with Generally Accepted Accounting Principles and open to inspection and subject to audit and/or reproduction by University's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of Cost of the Work, and any invoices, change order, payments or claims submitted by the Contractor or any of his payees pursuant to the execution of the contract.

4.03.2

Such audits may require inspection and copying from time to time and at reasonable times and places of any and all information, materials and data of every kind and character, including without limitation, records, books, papers, documents, subscriptions, recordings, agreements, purchase order, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may in University's judgment have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Contract Documents. Such records subject to audit shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs, (including overhead allocations) as they may apply to costs associated with this Agreement.

4.03.3

The University or its designee shall be afforded access to all of the Contractor's Records, and shall be allowed to interview any of the Contractor's employees, pursuant to the provisions of this article throughout the term of this contract and for a period of six (6) years after Final Payment or longer if required by law. To the extent University deems is allowed by law, the Contractor's records shall remain confidential. Contractor recognizes and agrees that University will disclose documents it deems is required or appropriate pursuant to law, defense against lawsuits or other claims, or other reason deemed necessary by University.

4.03.4

Contractor shall require all Subcontractors, insurance agents, and material suppliers (payees) to comply with the provisions of this article by insertion of the requirements hereof in a written contract agreement between Contractor and payee. Such requirements will also apply to Subcontractors and all lower tier Subcontractors. Contractor will cooperate fully and will cause all of Contractor's Subcontractors (including those entering into lump sum contracts, payees or lower tier Subcontractors) to cooperate fully by furnishing or making available to University from time to time whenever requested in an expeditious manner any and all such information, materials and data.

4.03.5

University's agent or its authorized representative shall have access to the Contractor's facilities, shall have access to all records deemed necessary by University; and shall be provided adequate and appropriate work space, in order to conduct review or audits in compliance with this article.

4.03.6

Contractor agrees that University's designee shall have the right to examine the Contractor's records (during the contract period and up to six(6) years after Final Payment is made on the contract) to verify the accuracy and appropriateness of the pricing data used to price change proposals or claims. Contractor agrees that if the University determines the cost and pricing data submitted (whether approved or not) was inaccurate, incomplete, not current or not in compliance with the terms of the contract regarding pricing of change orders, an appropriate contract price reduction shall be made. Such post-approval contract price adjustments will apply to all levels of Contractors and/or Subcontractors and to all types of change order proposals specifically including lump sum change orders, unit price change orders and cost-plus change orders.

4.03.7

If an audit, inspection or examination in accordance with this article, discloses overcharges (of any nature) by the Contractor to the University in excess of one percent (1%) of the total contract billings, the actual cost of the University's audit shall be reimbursed to the University by the Contractor. Any adjustments and/or payments which must be made as a result of any such audit or inspection of the Contractor's invoices and/or records shall be made within a reasonable amount of time (not to exceed 90 days) from presentation of University's findings to Contractor.

4.03.8

If this Agreement is determined to be subject to Section 1861(v)(1)(I) of the Social Security Act, as amended from time to time, the Contractor agrees that for a period of four (4) years following the expiration or earlier termination of this Agreement, the Contractor shall retain and make available to the Secretary of Health and Human Services, the Comptroller General of the United States, or any of their duly authorized representatives, this Agreement, and any books, documents, and records of the Contractor which are necessary to certify the nature and extent of amounts paid by the University pursuant to this Agreement. In the event access to books, documents, and records is requested by the Secretary, the Comptroller General, or any of their duly authorized representatives, the Contractor shall immediately notify the University and make such books, documents and records available to the University unless prohibited by law.

4.04 Applications for Payment

The Contractor shall prepare and deliver to the University monthly an itemized Application for Payment. The University shall pay the Contractor within thirty (30) days of receipt of a properly submitted, complete and correct Application for Payment. The Applications for Payment shall include a Schedule of Values describing the services included and Work completed in the Application for Payment. No interest shall accrue on any unpaid portion of the Applications for Payment or any other sums that the Contractor or any Subcontractor or supplier claim are or may be due under this Agreement.

The Application for Payment shall constitute a representation by the Contractor to the University that the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment. No progress payment, partial use or entire use of the Project by the University shall constitute acceptance of work not in strict conformity with the Contract Documents.

The Contractor shall keep records of cost and expense to support the Contractor's Applications for Payment, including without limitation records of staff time, material costs, and reimbursable expense items in connection with the Work. Financial records shall be kept on a generally recognized accounting basis, as approved by the University. Contractor shall make them readily available to the University or its representatives for inspection and audit for a period of six (6) years after the Project Close-out and Final Payment to the Contractor.

The Application for Payment shall be accompanied by a Sworn Statement completed by the Contractor, together with Certified Payrolls prepared in accordance with Section 5.02, as well as other documentation that may be required by the University, stating that all Subcontractors and suppliers have been paid in full for Work performed through the last or most recent progress payment.

4.05 Retainage

Payments to the Contractor shall be subject to retainage of ten percent (10%) of the Cost of Work for each Application for Payment until the Work is fifty percent (50%) complete; at that time, no further retainage will be deducted from the Applications for Payment. Draws on retainage may only be submitted after Substantial Completion and in the following quantities: (1) at the completion of all Punchlist items, the retainage may be reduced to two percent (2%); and (2) at delivery of all Closeout Documents and warranties, the remainder of the retainage may be paid to the Contractor. Any release of retainage shall be at the sole discretion of the University.

4.06 Final Payment

Issuance of Final Payment shall be expressly conditioned on certification of Substantial Completion, certification of Punchlist completion and written acceptance of closeout documents by the Design Professional and University.

5.00 WSU WAGES

5.01 Applicable Wage Rates

The Contractor acknowledges and shall abide by the University's prohibition on use of 1099 independent contractors and owner / operator business entities wherein such individuals or entities are not able to secure and maintain workers compensation insurance. The Contractor shall ensure that all classifications of laborers and construction mechanics performing Work on the Project job site are employees of the Contractor or any subcontractor for any tier thereof, and that each worker is covered by workers compensation insurance.

For this project, it is a University requirement that the Contractor and all Subcontractors and sub-subcontractors who provide labor on this project shall compensate each worker, regardless of their employment status, not less than the wage and fringe benefit rates prevailing in the locality in which the work is to be performed. At the time of advertising for bids on the project, the University shall provide the prevailing rates of wages and fringe benefits for all classes of construction mechanics called for in the Contract. A schedule of these rates shall be made a part of the specifications for the work to be performed and shall be printed on the bidding forms where the work is to be done by contract. Contractor shall also post on site, in a conspicuous place, a copy of all applicable wage and benefit rates, and shall provide the University with a copy of the applicable wage and benefit rates posted.

5.02 Certified Payroll Records and Supporting Documents

The Contractor and each Subcontractor shall keep an accurate record showing the name and occupation of and the actual benefits and wages paid to each laborer and mechanic working in connection with this contract and shall be submitted with each pay application in accordance with Section 4.04. Contractor shall be required to 1) collect all certified payroll records from Contractor and Subcontractors and sub-subcontractors; 2) provide and require Subcontractors and sub-subcontractors to provide the University access to supporting documentation, and 3) shall provide this information, records, and/or access to documentation to the University or its agent(s) or auditors for review or audit promptly on request. Contractor shall, and shall also require all subcontractors and sub-subcontractors to, promptly provide

information relating to payroll and job classification and work duties to University upon request. The University reserves the right to audit Contractor, Subcontractors, and sub-subcontractors for compliance with wage and hour requirements, WSU Wage, employee classifications and other applicable requirements.

5.02.1 Audit

In connection with the WSU Wage rate audit conducted by the University, the Contractor is required to maintain and/or promptly obtain the following information, records and documentation from Contractor, all Subcontractors, and all sub-subcontractors and to promptly provide them to the University upon request:

1. Canceled payroll checks
2. Pay stubs
3. Weekly time cards on time sheets
4. Payroll registers
5. Employee handbook
6. Fringe benefit plan documents
7. Minutes of Board of Directors meetings
8. Worksheets for calculation of non-cash fringe benefit amounts included in compensation
9. Apprentice certificates and other documents to verify registration of all apprentices in recognized apprentice program certified by the Bureau of Apprenticeship and Training (B.A.T.) of the U.S. Dept. of Labor or an acceptable equivalent
10. Other related documents as requested by the University.

5.02.2 Failure to Comply with Audit

If the requested information and/or records are not promptly provided pursuant to University's request, in addition to all other rights and remedies it has pursuant to law, equity and contract, the University, by written notice to Contractor and the sureties of the contractor known to the University may, but has no obligation or duty to, 1) terminate the contract with Contractor and University owe Contractor and be liable only for that prorated portion of satisfactorily completed work up to the date of termination; 2) withhold further payments owed until Contractor supplies the requested information and records and/or otherwise complies with the request for records and/or access to documentation; and 3) inform the Vice-President for Finance and Business Operations of what has been requested and what has not been provided by Contractor and/or subcontractor or sub-subcontractor. Contractor is hereby given express notice that failure to comply with University's requests for information and records may disqualify Contractor and/or non-complying Subcontractors/sub-subcontractors from bidding and/or receiving work on future University projects. The University may proceed to complete this contract by separate agreement with another contractor or otherwise and the original Contractor and its sureties shall be liable to the University for any excess cost occasioned thereby.

5.03 Classification of Workers

All apprentices utilized on this University project must be registered in a recognized apprentice program, i.e., one that is certified by the Bureau of Apprenticeship (B.A.T.), U.S. Department of Labor. The workers used on a University project by either Contractor or a Subcontractor must be employees of the Contractor or Subcontractor and not individuals claimed as subcontractors or independent contractors, such as individuals whose compensation is reflected on IRS form 1099. The use of individuals as independent contractors is prohibited without express written permission of the University.

5.04 Failure to Pay

If a Contractor or subcontractor fails to pay the prevailing rates of wages and fringe benefits and does not cure such failure within fourteen (14) days after notice to do so by the University, the University shall have the right, at its option, to do any or all of the following:

5.04.1

Withhold all or any portion of payments due the Contractor as may be considered necessary by the University to pay laborers and mechanics the difference between the rates of wages and fringe benefits required by this Agreement and the actual wage and fringe benefits paid.

5.04.2

Terminate part or all of this Agreement or any subcontract and proceed to complete the Agreement or subcontract by separate agreement with another contractor or otherwise, in which case the Contractor and its sureties shall be liable to the University for any excess costs incurred by the University.

5.04.3 University's Rights Cumulative

It is expressly understood by both parties that the above are in addition to University's other rights and remedies, and University retains all other rights and remedies it has pursuant to this Agreement, or otherwise, to enforce its rights to require that WSU Wages and fringe benefits be paid for the construction work on this Project, but the University shall have no duty or contractual obligation to enforce these provisions. Contractor agrees that it shall be solely responsible for ensuring that these requirements are met and shall handle and defend all complaints or claims regarding wage payments to construction mechanics without assistance or involvement of the University. Contractor shall permit its employees and workers, and its Subcontractors and sub-subcontractors and their employees and workers, to discuss payment and work duty information with University staff, but otherwise Contractor shall continually prohibit its employees and workers, and all subcontractors and sub-subcontractors and their employees and workers, from directing or making any claims or complaints regarding the payment of wages to any employee or official of the University, and shall indemnify and reimburse University for all expenses and fees, including attorney fees, which it incurs for defending or representing itself against such claims or complaints. The University shall not be asked to nor be responsible to address or resolve any disputes with or between Subcontractors on the Project.

5.05 Application to Subcontractors

The Contractor shall include terms identical or substantially similar to this section in all Subcontracts, Purchase Orders and other agreements pertaining to the Project.

6.00 OWNERSHIP OF ELECTRONIC OR HARD-COPY DOCUMENTS

All drawings and specifications and other data and materials prepared and furnished whether in electronic or hard-copy format by the University, the Design Professional and/or the Contractor shall become the property of the University. The Contractor shall have no claim for further employment or additional compensation as a result of exercise by the University of its full rights to ownership of such documents, information, data and materials. The Contractor shall not use or copy such documents, information, data or materials in any format for any purpose other than for the Project.

7.00 SUCCESSORS AND ASSIGNS

This Agreement shall be binding upon and inure to the benefit of the parties to this Agreement and their respective successors and assigns; provided, however, that none of the parties hereto shall assign this Agreement without the prior written consent of the other.

8.00 CLAIMS, DISPUTES AND GOVERNING LAW

8.00 CLAIMS AND DISPUTES

8.01 Claims Definition

A Claim is a demand or assertion by one of the parties seeking adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the parties arising out of or relating to the Contract. Claims must be made by written notice within a specified time period. The responsibility to substantiate Claims shall rest with the party making the Claim.

8.01.1 Policy of Cooperation

The parties shall endeavor to resolve all of their claims and disputes amicably and informally through open communication and discussion of all issues relating to the Project. To the greatest extent possible, the parties shall avoid invoking the formal dispute resolution procedures contained in the Contract Documents.

8.02 Recommendation of Design Professional

Claims must be referred initially to the Design Professional for action as provided in paragraph 8.10 as an express condition precedent to proceeding further in resolving any claim.

8.03 Time Limits on Claims

Claims must be made within 5 business days after occurrence of the event giving rise to such Claim or within 5 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been resolved by Change Order will not be valid.

8.04 Continuing Contact Performance

Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the University shall continue to make payments in accordance with the Contract Documents subject to the University's rights relative to payments, withholding of payments, termination, or all other rights afforded it in the Contract Documents.

8.05 Claims for Concealed or Unknown Conditions

If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then written notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 24 hours after first observance of the conditions. The Design Professional will promptly investigate such conditions and, if the conditions differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, the Design Professional will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Design Professional determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Design Professional shall so notify the University and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 5 days after the Design Professional has issued such determination. If the University and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the

adjustment shall be referred to the Design Professional for initial determination, subject to further proceedings pursuant to Paragraph 8.09.

8.06 Claims for Additional Cost

Any Claim by the Contractor for an increase in the Contract Sum shall be submitted in writing as required by the Contract Documents before proceeding to execute the Work. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Design Professional, (2) an order by the University to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Design Professional, (4) failure of payment by the University, (5) termination of the Contract by the University, (6) University's suspension or (7) changes in the scope of Work, the Contractor's claim shall be filed in strict accordance with the procedure established herein.

8.07 Claims for Additional Time

Any Claim by Contractor for an increase in the Contract Time shall be submitted in writing as required by this provision and the Contract Documents. The Contractor's Claim shall include an estimate of the probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

As a precondition for the Claim to be considered by the University, Contractor must identify the precise activities affected as located on the approved network Project Schedule. Contractor must also describe the efforts that it has made to mitigate the effects of any negative schedule impact.

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

8.08 Injury or Damage to Person or Property

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 5 days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in the Contract Documents.

8.09 Verification of Claims Submitted

With respect to any Claim asserted by Contractor for itself or on behalf of a Subcontractor for additional time or cost, the Contractor shall evaluate the claim and verify that any amounts claimed are valid, compiled in accordance with generally accepted accounting principles and are consistent with the terms of the existing contractual agreements regarding entitlement before presentation of the Claim to the Owner. Any Claim not verified in accordance with this requirement shall be denied without further recourse by the Contractor or Subcontractor.

8.10 Resolution of Claims and Disputes

8.10.1 Review by Design Professional

Design Professional will review all Claims and take one or more of the following preliminary actions within 10 days of receipt of a Claim: (1) request additional supporting data from the claimant, (2) submit a schedule to the parties indicating when the Design Professional expects to take action, (3) reject the Claim in whole or in

part, stating reasons for rejection, (4) recommend approval of the Claim by the other party or (5) suggest a compromise. The Design Professional may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

If a Claim has been resolved, the Design Professional will prepare or obtain appropriate documentation. If a Claim has not been resolved, the party making the Claim shall, within 10 days after the Design Professional's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested by the Design Professional, (2) modify the initial Claim or (3) notify the Design Professional that the initial Claim stands.

If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Design Professional, the Design Professional will notify the parties in writing that the Design Professional's opinion will be rendered within 5 days. Upon expiration of such time period, the Design Professional will render to the parties the Design Professional's written opinion relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Design Professional may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy. The opinion of the Design Professional shall be subject to the review of the Vice-President for Finance and Business Operations Wayne State University (VPFBO).

8.10.2 Review by Vice-President for Finance and Business Operations

The Vice-President for Finance and Business Operations (VPFBO) shall review the Design Professional's opinion and the supporting information submitted by the parties for the purpose of upholding the Design Professional's opinion, modifying the Design Professional's opinion, or rejecting the Design Professional's opinion. The VPFBO shall render a decision within forty-five days of the completion of any submissions by the parties. The decision of the VPFBO is final unless it is challenged by either party by filing a lawsuit in the Court of Claims of the State of Michigan within one year of the issuance of the decision.

8.10.3 Jurisdiction

Jurisdiction over all claims, disputes, and other matters in question arising out of or relating to this Contract or the breach thereof, shall rest in the Court of Claims of the State of Michigan. No provision of this agreement may be construed as the University's consent to submit any claim, dispute or other matter in question for dispute resolution pursuant to any arbitration or mediation process, whether or not provisions for dispute resolution are included in a document which has been incorporated by reference into this agreement.

8.10.4 Condition Precedent

The process and procedures described in Section 8.10 are an express condition precedent to filing or pursuing any legal remedy including litigation. Pursuing litigation prior to exhaustion of the Dispute Resolution process set forth herein shall be premature and a material breach of this Agreement.

8.10.5 Governing Law

This Agreement shall be governed by and construed in accordance with the laws of the State of Michigan.

9.00 NON-DISCRIMINATION

9.01 General

The Contractor shall not discriminate against any job applicant, contractor, or employee because of race, color, religion, national origin, age, sex (including gender identity) height, weight, or familial, disability, or

veteran status, and shall include terms identical or substantially similar to this section in all Subcontracts, Purchase Orders and other agreements pertaining to the Project.

9.02 Solicitation/Advertisements

The Contractor shall in all solicitation or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, sex (including gender identity), height, weight, or familial, disability or veteran status.

9.03 Rules/Laws

The Contractor shall comply with all applicable federal and state laws, and current published rules, regulations, directives, and orders of the Michigan Civil Rights Commission and other governmental agencies/departments.

9.04 Reports

The Contractor shall furnish and file compliance reports within such time and upon such forms as provided by the Michigan Civil Rights Commission; these forms may also elicit information as to the practices, policies, program, and employment statistics of the Contractor and of each Subcontractor. The Contractor shall permit access to all books, records, and accounts by the Michigan Civil Rights Commission and/or its agents, for purposes of investigation to ascertain compliance with this contract and with rules, regulations, and orders of the Michigan Civil Rights commission.

9.05 Persons with Disabilities

The Contractor shall comply with the provisions of the Michigan Persons with Disabilities Civil Rights Act (M.C.L. 37.1101, et seq.).

9.06 Contract Provisions

The Contractor shall include, or incorporate by reference, the provisions of this Article in every Subcontract, Subcontract and purchase order unless exempted by the rules, regulations or orders of the Michigan Civil Rights Commission, and shall provide in every Subcontract, subcontract or purchase order that said provisions shall be binding upon each Subcontractor, subcontractor or seller.

10.00 ADDITIONAL PROVISIONS

10.01 Prohibited Contracts or Subcontracts due to Unfair Labor Practices

Public Act No. 278 of 1980 prohibits State of Michigan from awarding Contract or Subcontract to employer who has been found in contempt of court by a Federal court of appeals, on not less than three (3) occasions involving different violations during preceding seven (7) years, for failure to correct unfair labor practice as prohibited by Section 8 of Chapter 372 of National Labor Relations Act, 29 U.S.C. 158. Contractor may not in relation to that Contract subcontract with such employer. The University may rescind, or require Contractor to rescind a contract if the employer or Subcontractor, manufacturer, or supplier of employer subsequently appears in register of such employers which will be compiled by Michigan's Department of Licensing and Regulatory Affairs, pursuant to Section 2 of Public Act No. 278 of 1980.

10.02 Buy-American

University endeavors to buy products made in the United States of America whenever an American-made product is available that meets or exceeds the specifications requested and the price is equal to or lower than foreign-made product. Vendors and Contractors are instructed to bid American-made products and/or services whenever available. Vendors and Contractors may bid foreign-made products or services when:

1. those products or services are specified, or
2. as an alternate as long as the products or services are technically acceptable to the University and American-made goods or services that are competitively price and of comparable quality are not available.

A product or service shall be considered "American-made" if more than 50% of the product is manufactured or assembled in the United States or more than 50% of the services are performed in the United States.

10.03 Michigan Products

Contractor and its Subcontractors and suppliers shall utilize Michigan-made products whenever possible where price, quality and performance are equal to or better than non-Michigan products.

10.04 Drug and Alcohol Testing

The University is a "DRUG FREE WORKPLACE", and the University requires Contractors, Subcontractors and sub-subcontractors with access to the work site to abide by the University's policies on drugs, alcohol and tobacco, which can be found at http://bog.wayne.edu/code/2_20_04.php and <http://policies.wayne.edu/administrative/00-03-smoke-free-campus.php>. All costs for initial and periodic testing shall be borne by the Contractor.

1. The Contractor and University shall reserve the right to administer drug and alcohol tests to any and/or all site personnel at random periods and without notice.
 - a. The Contractor shall be responsible for all costs including wages for those individuals testing drug or alcohol-free at the Contractor's direction.
 - b. Subcontractors shall be responsible for all costs including wages for those individuals not testing drug or alcohol-free at the direction of the Contractor, and the Subcontractor shall immediately remove those individuals from the site.
4. Any individual not testing drug or alcohol-free shall not be allowed to return to the site under any circumstances.

10.05 Other University Policies

The University's policies related to Duty to Report Criminal Acts and Weapons on Campus shall apply to this Project and Contractor shall include this requirement in all Subcontracts, purchase orders and supply agreements.

10.06 University Representative

The University's Representative shall be the Associate Vice President of Facilities Planning and Management, the Senior Director of Design and Construction Services, the Director of Design and Construction Services and the Project Manager . Any project decision on behalf of the University may only be in accordance with the Authorization Matrix that is attached as Exhibit C and incorporated by reference.

11.00 INCLUSION BY REFERENCE

This Contract and Contract Documents hereby include and incorporate by reference the General Conditions of Construction and Supplementary General Conditions, the Request for Proposal by University, the approved plans and specifications, Contractor's Bid or Proposal insofar as it is not inconsistent with the other Contract Documents and other Project documents attached as Exhibits.

Exhibit A – Contractor's Bid or Proposal

Exhibit B – Basis of Compensation

Exhibit C - Authorization Matrix

Exhibit D – Staffing Plan

12.00 TERMINATION

12.01 Termination by the University for Cause

12.01.1

The University may terminate the Contract if the Contractor: (a) becomes insolvent; (b) files or has filed against it any Petition in Bankruptcy or makes a general assignment for the benefit of its creditors; (c) fails to pay, when due, for materials, supplies, labor, or other items purchased or used in connection with the Work; (d) refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will ensure the completion of the Work in accordance with the Master Project Schedule; (e) in the University's opinion, persistently fails, refuses or neglects to supply sufficient labor, material or supervision in the prosecution of the Work; (f) interferes with or disrupts, or threatens to interfere with or disrupt the operations of the University, or any other Contractor, supplier, subcontractor, or other person working on the Project, whether by reason of any labor dispute, picketing, boycotting or by any other reason; or (g) commits any other breach of this Contract.

When any of the above reasons exist, the University may, without prejudice to any other rights or remedies of the University and after giving the Contractor and the Contractor's surety, if any, three days written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety: (1) take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor; (2) accept assignment of subcontracts; and (3) finish the Work by whatever reasonable method the University may deem expedient.

When the University terminates the Contract for one of the stated reasons, the Contractor shall not be entitled to receive further payment until the Work is finished.

12.01.2

If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Design Professional's services and expenses made necessary thereby, the remaining balance shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the University. The amount to be paid to the Contractor or University, as the case may be, shall be certified by the Design Professional, upon application, and this obligation for payment shall survive termination of the Contract.

12.02 Suspension by the University for Convenience

12.02.1

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

12.02.2

An adjustment shall be made for increases in the cost and/or time of performance of the Contract, including profit on the increased cost of performance, caused by suspension, delay or interruption. No adjustment shall be made to the extent: (1) that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or (2) that an equitable adjustment is made or denied under another provision of this Contract.

Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

12.03 Termination By The University For Convenience

12.03.1

The University, with or without cause, may terminate all or any portion of the services by the Contractor under this Agreement, upon giving the Contractor 30 days written notice of such termination. In the event of termination, the Contractor shall deliver to the University all reports, estimates, schedules, subcontracts, Contract assignments, purchase order assignments, and other documents and data prepared by it, or for it, pursuant to this Agreement.

12.03.2

Unless the termination is for cause, the Contractor shall be entitled to receive only the payments provided for in Article 4, pro-rated to the date of termination (including payment for the period of the 30-day notice) plus reimbursement for approved and actual costs and expenses incurred by the Contractor to the date of termination. Prior to payment, the Contractor shall furnish the University with a release of all claims against the University.

12.04 Termination By The Contractor

12.04.1

The Contractor may terminate the Contract if the Work is stopped for a period of 60 days through no act or fault of the Contractor or a subcontractor, sub-subcontractor or their agents or employees or any other persons performing portions of the Work under Contract with the Contractor, for any of the following reasons: (1) issuance of an order of a court or other public authority having jurisdiction; (2) an act of government, such as a declaration of national emergency, making material unavailable; (3) because the Design Professional has not approved a Certificate for Payment and has not notified the Contractor of the reason for withholding approval, or because the University has not made payment of undisputed amounts on an approved Certificate for Payment within the time stated in the Contract Documents; (4) if repeated suspensions, delays or interruptions by the University constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

If one of the above reasons exists, the Contractor may, upon seven additional days' written notice to the University and Design Professional, terminate the Contract and recover from the University payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead and profit.

12.04.2

If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a subcontractor or their agents or employees or any other persons performing portions of the Work under Contract with the Contractor because the University has persistently failed to fulfill the University's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the University and the Design Professional, terminate the Contract and recover from the University as provided in Subparagraph 12.03.2

13.00 COMPLETE AGREEMENT

The Contract Documents constitute the entire agreement between the parties and supersede any prior discussions or negotiations. Any modification of these Contract Documents must be in writing and signed by the duly authorized representatives of the parties.

IN WITNESS WHEREOF, each of the parties has caused this Agreement to be executed by its duly authorized representative on the dates shown beside their respective signatures, with the contract to be effective upon the date set forth above.

CONTRACTOR

Wayne State University

By: _____

By: _____

Name: _____

Name: William R. Decatur

Title: _____

Title: VP Finance & Business Operations

Date: _____

Date: _____

Exhibit A – Contractor's Bid or Proposal

[GENERAL CONTRACTOR'S NAME] bid/proposal dated _____.

Exhibit B – Basis of Compensation

- a. The University shall pay the Contractor a not to exceed amount of \$\$\$\$\$\$ ("Amount in words 00"/100 dollars) based on unit pricing in the proposal which will be adjusted to reflect actual units used for the performance of all work associated with the Contractor's Base Bid "and Alternates (List)".
- b. List of Alternates. The University may, at its sole discretion, during the life of the contract, award the following alternates at the amounts indicated: (If this section is not used, delete all text and enter_ Deleted)

	<u>Description</u>	<u>Amount</u>
Alternate 1		
Alternate 2		
Alternate 3		

- c. List of unit prices. In the event additional work becomes necessary, the following unit prices will apply:
"(If section 3.3 is not used, delete all text and enter_Deleted"

Work Item

Unit Price

- 1.
- 2.

- d. Liquidated Damages. It is understood and agreed that, if the project is not completed within the time specified in the Agreement plus any extension of time allowed pursuant thereto, the actual damages sustained by the University because of any such delay will be uncertain and difficult to ascertain, and it is agreed that the reasonable foreseeable value of the use of said project by the University would be the sum of \$_____ (_____ Hundred 00/100 dollars) per day. Therefore, the Contractor shall pay as liquidated damages to the University the sum of \$_____ (_____ Hundred 00/100 dollars) per day for each day's delay in substantially completing said project beyond the time specified in this Agreement and any extensions of time allowed thereunder.

Sample

**WAYNE STATE UNIVERSITY
GENERAL CONDITIONS OF CONSTRUCTION**

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GENERAL CONDITIONS OF CONSTRUCTION

1.00 DEFINITIONS

Bulletin - A bulletin is defined as a compilation of changes to the scope of the work issued by the Design Professional or University which requests the Contractor to submit a quote for the changes.

Change Order - A written agreement entered into after the award of the Contract which alters or amends the executed Contract.

Claim - A Claim is a demand or assertion by one of the parties seeking adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the parties arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

Close-out Documents - Close-out Documents shall include as-built record drawings and specifications, Operations and Maintenance Manuals, Requests for Information (RFIs), submittals, shop drawings, coordination drawings, warranties, unconditional lien waivers and governing approvals.

Cost of Work - The term Cost of Work, as used herein, is that portion of the Project Cost, that is the estimated or actual labor and material costs of that Work performed (or to be performed) on the Project by the Contractor and all subcontractors, and is inclusive of the cost of construction as described by divisions of the Construction Specifications Institute or other standard format, which constitutes the Direct Cost of Work. However, Cost of Work shall not include the Indirect Cost of Work as herein defined.

Contract - The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a duly executed written Change Order.

Contract Documents - The Contract Documents consist of the bonds, insurance certificates, plans, specifications, drawings, bulletins, addenda, Agreement, General Conditions of Construction, Supplementary General Conditions, Change Orders, Contractor's Bid, and to the extent not otherwise inconsistent with any other Contract Document.

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Project. Contract Documents are complementary, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to be consistent with the Contract Documents and the highest standard of care. In the case of an inconsistency between, or perceived omission or error in the Drawings, Specifications, or other Contract Documents which is not clarified by addendum or Requests for Information (RFI), or should the Contractor be in doubt as to their exact meaning, the Contractor shall notify the Design Professional and the University at once. The University shall not be responsible for the Contractors misinterpretations of Drawings and Specifications and/or other Contract Documents.

Nothing contained in the Contract Documents shall create a contractual relationship between University and any third party; however, the University is an intended third-party beneficiary of all contracts for design and engineering services, all subcontracts, purchase orders and other agreements between Contractor or Design

Professional and third parties. The Contractor and Design Professional shall incorporate the obligations of the Contract Documents into its respective subcontracts, agreements and purchase orders.

Contractor: The term "Contractor" as used in the General Conditions shall include the term "Construction Manager" as used in the Contract for Construction Management Services.

Contractor's Construction Schedule- The construction schedules required by the Contract Documents shall be a logic network prepared in the critical path method or other sequential network in use within the construction industry and shall depict: (1) a sequence of operations mutually agreeable to the University, Design Professional and Contractor; (2) the dates of commencement and completion of each task of the Work (including lead time activities, drawing and sample submissions, bidding, awarding Trade Contracts, manufacturing and shipping); (3) delivery dates for materials and equipment; and (4) at the University's request shall include all Finish Work to be performed by separate Contractors. The construction schedule includes a complete itemized breakdown of the Work.

Contract Sum- The Contract Sum shall be the total dollar value of the Agreement between the University and Contractor.

Delay – A delay shall be recognized as a time of completion impact on the performance of the Work by the Contractor that extends the overall duration of the Project beyond the substantial completion and final completion dates specified in the Agreement. A delay shall not be recognized if the time of completion impact on the performance of the Work occurs on a non-critical path activity, and does not extend the overall duration of the Project.

Day - "Days" means calendar days unless specifically provided to the contrary herein or in the Construction Agreement; provided, however, if any day falls on a weekend or a holiday, same shall refer to the next business day thereafter.

Design Professional - The Design Professional is the person lawfully licensed to practice architecture or engineering or an entity lawfully practicing architecture or engineering identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Design Professional" means the Design Professional or the Design Professional's authorized representative.

Final Completion - "Final Completion" means the completion of all the Work in accordance with the Contract Documents and the acceptance thereof by the University. Completion of the Work includes (1) full performance of all Contract terms; (2) acceptance of the Work by University; (3) resolution of all outstanding Changes of Contract; (4) completion of all "punch-list" items; and (5) delivery of all Close-out Documents.

Incomplete Construction List – The Incomplete Construction List is prepared by the Contractor for review by Design Professional and University identifying Work remaining to be completed at the time of Substantial Completion and the date by which Contractor shall complete the Work on the Incomplete Construction List.

Knowledge - The terms "knowledge," "recognize" or "discover," their respective derivatives and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows or should know, recognizes or should reasonably recognize and discovers or should reasonably discover in exercising the care, skill and diligence required by the Contract Documents.

Master Project Schedule - The Master Project Schedule shall show the sequence, duration in calendar days, interdependence for the complete performance of all Work. The Master Project Schedule shall begin with the date of issuance of the Notice to Proceed and conclude with the date of final completion.

Notice to Proceed - A "Notice to Proceed" means written notice given by the University to the Contractor fixing the date on which the Contract Time will commence to run and/or on which Contractor shall start to

perform Contractor's obligations under the Contract Documents. A Notice to Proceed by the University shall authorize all or a portion of the Work for the Costs so defined.

Persistently fails - The phrase "persistently fails" and other similar expressions, as used in reference to the Contractor, shall be interpreted to mean any combination of acts and omissions, which cause the University to reasonably conclude that the Contractor will not complete the Work within the Contract Time, or for the Contract Sum or in substantial compliance with the requirements of the Contract Documents.

Plans - The drawings prepared by the Design Professional and accepted by the University which include elevations, sections, details, schedules, diagrams, information, notes, or reproductions or any of these, and which show the location, character, dimension, or details of the Work. These include the graphic and pictorial portions of the Contract Documents as listed in the Agreement.

Preliminary Project Cost and Schedule Impact Report – The direction from the University to perform changed Work in the absence of agreement between the University and Contractor, which may result in a Change Order upon agreement of the cost or schedule impact.

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

Punchlist - Punchlist items shall include all Work remaining on the Contractor's Incomplete Construction List and additional items documented by the Design Professional, Contractor and University and issued to the Contractor and may be issued with a Certificate of Substantial Completion. It is understood and accepted that the Punchlist included with the Certificate of Substantial Completion may not represent all remaining Work for which the Contractor is obligated and that Punchlist may be expanded prior to Final Completion.

Reasonably inferable - The phrase "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a Contractor familiar with the Project and exercising the care, skill and diligence required by Contract Documents.

Site - The area specified in the Contract Documents and the area made available for the Contractor's operation.

Soft Costs - "Soft Costs" are those costs derived by the University and shall include, but not be limited to, items such as Environmental services, State administration fees, Design Professional fees, moving furniture, fixtures and equipment, and telecommunications, unless otherwise agreed to by the Parties.

Specifications - The term Specifications shall mean the written instructions and requirements prepared by the Design Professional which complement the plans and which describe the manner of executing the Work or the qualities and types of materials to be furnished.

Statement of Probable Cost - The Statement of Probable Cost, as developed by the Contractor, is essential to the budgetary and management processes of the University. The Statement of Probable Cost, once established and accepted by the University, is relied upon by the University for its subsequent budgetary planning and financial needs for the Project.

The Statement of Probable Cost, applicable to either an estimated or actual cost, is the sum of all costs for a completely constructed, functionally ready-for-use project, in accordance with the scope, scheme, concept, and statement, as developed, documented and accepted by the University, and as constructed by the accepted contracting method or methods. The Contractor shall provide Statements of Probable Cost as needed during the Project to aid the University and Design Professional in making scope of work selection decisions, especially during design phase and minimally at the end of each design phase of the Project and shall include all costs included in the Contract Sum. The University shall be responsible for the derivation and provision of all Soft Costs that comprise the Project scope and budget.

Subcontractor - The term "subcontractor" shall mean any business entity under contract to the Contractor for services on or regarding the Project. The term "Subcontractor" as used in the General Conditions shall be synonymous with the term "Trade Contractor" as used in the Contract for Construction Management Services. Nothing contained in this contract shall create any contractual relationship between the University and any subcontractor. However, the University is the intended third-party beneficiary of all contracts for design, engineering or consulting services, all Trade Contracts, subcontracts, purchase orders and other agreements between the Contractor and third parties. The Contractor shall incorporate the obligations of this Agreement into its respective Trade Contracts, subcontracts, supply agreements and purchase orders.

Substantial Completion - "Substantial Completion" shall mean the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the University can occupy or utilize the Work for its intended use. Substantial Completion shall only be determined as described in the Contract Documents.

Unsafe Persons – Unsafe persons shall be those individuals that present a safety hazard to themselves or others.

University - The University is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "University" means the University or the University's authorized representative. Any reference to "Board of Governors" shall be considered to mean "University."

University's Representative - The University's Representative shall include the Associate Vice President for Facilities Planning and Management, the Senior Director of Design and Construction Services, the Director of Design and Construction Services and the Project Manager. Any project decision on behalf of the University may only be in accordance with the Authorization Matrix.

Vice President of Finance and Business Operations - The Vice President of Finance and Business Operations shall be the level of review over the Associate Vice President of Facilities Planning & Management.

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

2.00 BIDDING

2.01 Duty to Carefully Examine These Instructions

Prospective bidders for this project shall carefully examine the instructions contained herein and be cognizant of and satisfied with the conditions which must be satisfied prior to submitting a proposal and to the conditions which affect the award of the Contract.

2.02 Disclosure of Bidders

The Contractor shall only accept proposals from Subcontractors who are acceptable to the University.

2.03 Clarification During Bidding

The Contractor shall examine the plans and specifications in preparing the bid and shall immediately report to the Design Professional any omissions, discrepancies, or apparent errors found in the plans and specifications. Prior to the date of bid opening, bidders shall submit a written request for clarification in accordance with the instruction contained in the request for bids. If time permits, such clarification shall be issued in the form of addenda to all bidders.

2.04 Bidding Documents

2.04.1 Bid Proposal Package

Each bidder will receive a bid proposal package containing a standard proposal form which shall be used for bidder's proposal. Each proposal shall give the prices proposed in the manner required by the proposal and shall be signed by the bidder or the bidder's duly authorized representative, with its address and telephone number. If the proposal is made by an individual, the individual's name, postal address, and telephone number must be shown. If made by a partnership, the proposal shall have the signature of all partners or an affidavit signed by all partners empowering one partner as an agent to act in their behalf and the address and telephone number of the partnership. A proposal submitted by a corporation shall show the name of the state in which the corporation is chartered, the name of the corporation, its address and telephone number, and the title of the person who signs on behalf of the corporation.

2.04.2 Listing of Proposed Subcontractors Acceptable to the University

The Contractor will require every subcontractor to provide the name and location of the place of business of each Subcontractor and subordinate Subcontractor which will perform work or labor or render services for the Project.

2.04.3 Bidder's Security

All bids shall be presented under sealed cover and have enclosed an amount as directed in the instructions to bidders as bid security. The bid security may be a cashier's check made payable to Wayne State University or as otherwise directed in the instructions to bidders.

2.05 Bid Proposals

2.05.1 Submission of Proposals

Proposals shall be submitted to the office indicated on the bid proposal. It is the responsibility of the bidder to see that its bid is received in the proper time. Delays in timely receipt of the bid caused by the United States or the University mail system, independent carriers, acts of God, or any other cause shall not excuse late

receipt of a bid. Any bid received after the scheduled closing time for receipt of bids shall not be considered and will be rejected by the University, opened, retained by the University or returned to the bidder unopened.

2.05.2 Withdrawal of Proposals

Any bid may be withdrawn at any time prior to the time fixed for receiving bids but only by a written request from the bidder or its authorized representative filed with the University. An oral, faxed, or telephonic request to withdraw a bid proposal is not acceptable. The withdrawal of a bid shall not prejudice the right of a bidder to file a new bid. This paragraph does not authorize the withdrawal of any bid after the time fixed for receiving bids.

2.05.3 Public Opening of Proposals – SECTION DELETED

2.05.4 Rejection of Irregular Proposals

Proposals may be rejected if they show any alterations of forms, additions not called for, conditional bids, incomplete bids, erasures, or irregularities of any kind. If the bid amount is changed after the amount has been once inserted, the change shall be initialed.

2.05.5 Power of Attorney or Agent

When proposals are signed by an agent, a power of attorney shall either be on file with the University prior to the opening of bids or be submitted with the proposal. Failure to submit a power of attorney may result in the rejection of the proposal as irregular and unauthorized. A power of attorney is not necessary in the case of a general partner of a partnership.

2.05.6 Waiver of Irregularities/University's Right to Reject Bids

The University reserves the right to waive any or all irregularities in proposals submitted. The University reserves the right to reject any or all of the bids submitted.

2.05.7 Exclusion from Contract Documents

Nothing in any of the bidding documents, including but not limited to Request for Proposal form, Notice to Contractors, Proposal by Contractor and Design Professional and bids including any attachments or exhibits by Contractor, shall be considered part of the Contract Documents unless specifically incorporated.

2.06 Mistake in Bid

A bidder shall not be relieved of a bid nor shall any change be made in a bid because of mistakes without consent of the University. Failure by the Contractor to honor its proposal following the opening of bids for any reason shall result in the forfeiture of the Bid Security and possible suspension from future work consideration by and with the University.

2.07 Non-Discrimination

Wayne State University is an affirmative action/equal opportunity employer. The University has a strong commitment to the principle of diversity in all areas.

The Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, color, religion, national origin, age, sex (including gender identity), height, weight or familial, disability or veteran status. The Contractor will ensure that applicants are employed and that employees are treated during employment, without regard to their race, color, religion, national origin, age, sex (including gender identity), height, weight or familial, disability, or veteran status. Such action shall

include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor shall, in all solicitation or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, (including gender identity), height, weight or familial, disability or veteran status.

The Contractor shall comply with all requirements of the Elliott-Larsen Civil Rights Act being 1976 PA 453, as amended.

The Contractor shall also comply with the Persons with Disabilities Civil Rights Act being 1976 PA 220, as amended.

The Contractor shall include, or incorporate by reference, the provisions of this Article 2.07 in each and every subcontract or purchase order and shall provide in each and every subcontract or purchase order that said provisions will be binding upon each and every subcontractor and Supplier and Vendor.

Any breach of the requirements and covenants of this Article 2.07 shall constitute a material breach of the Contract Documents.

3.00 AWARD AND EXECUTION OF CONTRACT

3.01 Contract Bonds and Insurance

3.01.1 Payment and Performance

The Contractor shall forward to the University fully executed Payment & Performance Bonds in the amount of 100 percent of the Contract value on the AIA Form 312 or an equivalent form that is acceptable to the University and in compliance with MCL 129.201 et seq. within five (5) days after execution of the Agreement.

In the same five (5) day period the Contractor shall present to the University, in an acceptable form, evidence of the insurance as required by the Contract Documents. Actual Work shall not commence until the bond and insurance is received by the University. Failure to provide the bond and insurance in the time-frame allowed shall not be cause for an extension of Contract Time.

All alterations, extensions of time, extra and additional work, and other changes authorized by any part of the Contract, including determinations made under Article 7.00, Claims and Disputes, shall be made without securing the consent of the surety or sureties on the Contract bonds.

Whenever the University has cause to believe that the surety has become insufficient, the University may demand in writing that the Contractor provide such further bonds or additional surety, not exceeding that originally required, as in the University's opinion is necessary, considering the extent of the work remaining to be done. Thereafter no payment shall be made to the Contractor or any assignee of the Contractor until the further bonds or additional surety have been furnished.

Contract bonds shall remain in full force and effect during the repair and guarantee period required by the Contract Documents.

3.02 Execution of Contract

The Contract shall be signed by the Contractor in three (3) duplicate counterparts and returned to the University within five days of receipt from the University, not including Saturdays, Sundays, or legal holidays. No Contract shall be binding upon the University until it has been executed by the Contractor and a University official in accordance with the Authorization Matrix.

3.03 Failure or Refusal to Execute Contract

Failure or refusal by the Contractor to execute the Contract within the time set in Section 3.02 shall be just cause for the rescission of the award and the forfeiture of bidder's security. Failure or refusal to file acceptable bonds within the time set in Section 3.01 constitutes a failure or refusal to execute the Contract. If the Contractor fails or refuses to execute the Contract, the University may award the Contract to another contractor and the Contractor shall forfeit his Cashier's Check.

4.00 RESPONSIBILITIES OF THE PARTIES

4.01 University

4.01.1 Information and Services Required of the University

The University shall make available existing surveys describing physical characteristics, legal limitations and utility locations for the site of the Project. The University does not warrant or guarantee the accuracy of the information provided.

Unless otherwise agreed to, the University shall be responsible for the abatement of asbestos containing materials and/or site related environmental hazards. The University will provide documentation regarding the presence of asbestos containing materials or other possible environmental hazards to the Contractor. Second opinions on previously documented clean conditions shall be provided at the Contractor's expense. Positive results regarding environmental hazards shall become the University's obligation. If, during the execution of the Work, previously unknown environmental hazards are encountered, the University shall be allowed a reasonable amount of time to abate environmental hazards.

The University shall provide available information regarding requirements for the Project including plans and specifications for the buildings and a survey of the site where required. The Contractor shall review the plans and specifications and survey, if provided, for errors, inconsistencies, ambiguities or omissions as required by Article 4.02.2, Review of Contract Documents and Field Conditions by Contractor. In the event errors, inconsistencies, ambiguities or omissions in the plans, drawings, and specifications were not reasonably identifiable in the Contractor's review as specified in Article 4.02.2, Review of Contract Documents and Field Conditions by Contractor, and such errors, inconsistencies, ambiguities or omissions result in changes in time and cost, the University may make reasonable adjustment in the Contract Sum in accordance with Article 6.00, CHANGES IN THE WORK of the General Conditions.

Except for permits and fees, which are the responsibility of the Contractor under the Contract Documents, the University shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

Information or services under the University's control shall be furnished by the University with reasonable promptness to avoid delay in orderly progress of the Work.

All reproduction required for construction is the obligation of the Contractor.

4.01.2 University's Right to Stop the Work

If, in the University's determination, the Contractor fails to correct work which is not in accordance with the requirements of the Contract Documents as required, or persistently fails to carry out work in accordance with the Contract Documents, the University Representative, by written order may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the University to stop the Work shall not give rise to a duty on the part of the University to exercise this right for the benefit of the Contractor or any other person or entity.

It is understood that while the Contractor is fully responsible for the safety of the jobsite, and for the methods of its execution, if the University deems that the Contractor is failing to provide safe conditions, the University may stop or restrict the Work under such conditions. However, this right shall not create such duty on the University. Under no circumstance shall the Contractor be granted a time extension or Contract Sum increase for conditions resulting by a stop work order occurring as a consequence of the Contractor's failure to maintain safe working conditions.

4.01.3 University's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a three (3) day period after receipt of written notice from the University to commence and continue correction of such default or neglect with diligence and promptness, the University may after such three (3) day period, without prejudice to other remedies the University may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Design Professional's additional services and expenses made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the University.

4.01.4 University's Right to Audit

4.01.4.1

Contractor's records, which shall include but not be limited to accounting records (hard copy, as well as computer readable data if it can be made available), written policies and procedures; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets, correspondence; change order files (including documentation covering negotiated settlements); backcharge logs and supporting documentation; general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends; and any other supporting evidence deemed necessary by the University to substantiate changes related to the Agreement (collectively referred to as "Records") shall be maintained in accordance with Generally Accepted Accounting Principles and open to inspection and subject to audit and/or reproduction by University's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of Cost of the Work, and any invoices, change order, payments or claims submitted by the Contractor or any of his payees pursuant to the execution of the contract that are or have been charged on a basis other than a lump sum approved in writing by the University.

4.01.4.2

Such audits may require inspection and copying from time to time and at reasonable times and places of any and all information, materials and data of every kind and character, including without limitation, records, books, papers, documents, subscriptions, recordings, agreements, purchase order, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may in University's judgment have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Contract Documents. Such records subject to audit shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs, (including overhead allocations) as they may apply to costs associated with this Agreement.

4.01.4.3

The University or its designee shall be afforded access to all of the Contractor's Records, and shall be allowed to interview any of the Contractor's employees, pursuant to the provisions of this article throughout the term of this contract and for a period of five (5) years after Final Payment or longer if required by law. To the extent feasible, the Construction Manager's records shall remain confidential, and the University's third party auditors will enter into a confidentiality agreement between and among the University, the third-party auditor and the Contractor prior to any audits being conducted.

4.01.4.4

Contractor shall require all Subcontractors and material suppliers (payees) to comply with the provisions of this article by insertion of the requirements hereof in a written agreement between Contractor and payee so as to allow the University to verify any amounts charged to the Project by a payee on a basis other than a lump sum approved in writing by the University. Such requirements will also apply to Subcontractors and all lower tier Subcontractors. Contractor shall cooperate fully and shall cause all of Contractor's Subcontractors to cooperate fully by furnishing or making available to University from time to time whenever requested in an expeditious manner any and all such information, materials and data.

4.01.4.5

University's agent or its authorized representative shall have access to the Contractor's facilities, shall have access to all necessary records; and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this article.

4.01.4.6

Contractor agrees that University's designee shall have the right to examine the Contractor's records (during the contract period and up to five (5) years after Final Payment is made on the contract) to verify the accuracy and appropriateness of the pricing data used to price change proposals or claims. Contractor agrees that if the University determines the cost and pricing data submitted (whether approved or not) was inaccurate, incomplete, not current or not in compliance with the terms of the contract regarding pricing of change orders, an appropriate contract price reduction will be made. Such post-approval contract price adjustments will apply to all levels of contractors and/or subcontractors and to all types of change order proposals specifically including lump sum change orders, unit price change orders and cost-plus change orders.

4.01.4.7

If an audit, inspection or examination in accordance with this article, discloses overcharges (of any nature) by the Contractor to the University in excess of five percent (5%) of the total contract billings, the actual cost of the University's audit shall be reimbursed to the University by the Contractor. Any adjustments and/or payments which must be made as a result of any such audit or inspection of the Contractor's invoices and/or records shall be made within a reasonable amount of time (not to exceed 90 days) from presentation of University's findings to Contractor.

4.02 Contractor

The Contractor recognizes the relationship of trust and confidence established between the University and the Contractor by this Contract. The Contractor shall furnish the University with its best skill and judgment and fully cooperate with the University in furthering its best interests. All the Work is to be done in the best manner by persons skilled in the type of Work to be performed.

4.02.1 Contractor's Responsibility for the Work

The Contractor shall be responsible to the University for all Work performed under this Contract. For purposes of assessing responsibility to the Contractor by the University, all persons engaged in the Work shall be considered employees of the Contractor. The Contractor shall give its personal attention to the fulfillment of the Contract and keep all phases of the Work under its control.

4.02.2 Review of Contract Documents and Field Conditions by Contractor

The Contractor shall have a continuing duty to read, carefully study and compare the Contract Documents as defined in Article 1.00, DEFINITIONS, and product data with each other and with information furnished by the University. The Contractor shall perform construction coordination and constructability review of the Contract Documents and shall at once report to the Design Professional and the University, any errors, inconsistencies, ambiguities and omissions before proceeding with the affected Work. The Contractor shall be liable to the University for damage resulting from the Contractor's failure to properly perform such reviews or failure to promptly report any errors, inconsistencies, ambiguities or omissions identified in the Contract Documents to the Design Professional and the University. If the Contractor performs any construction activity that involves such error, inconsistency, ambiguity or omission in the Contract Documents without such notice to the Design Professional and the University, the Contractor shall assume responsibility for such performance and shall bear all costs attributable for correction. If the Contractor submits authorized substitutes that cost in excess of the Contract Sum or which cause coordination conflicts, the Contractor shall bear all costs attributable to correction.

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

The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Design Professional and University at once.

4.02.3 Supervision and Construction Procedures

The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible to the University for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters.

The Contractor shall be responsible to the University for acts and omissions of the Contractor's employees, subcontractors and their agents and employees, and other persons performing portions of the Work under a Contract with the Contractor.

The Contractor agrees to furnish efficient business administration, coordination, supervision and superintendence of the Work and to furnish at all times a competent and adequate administrative and supervisory staff and an adequate supply of workmen and materials to perform the Work in the best and most sound way in the most expeditious and economical manner consistent with the interests of the University. The Contractor agrees from time to time at the University's request to furnish estimates and technical advice as to construction methods and equipment to the University and Design Professional.

The Contractor agrees to cooperate with the Design Professional, University's Representative, commissioning agents, and all persons or entities retained by the University to provide consultation and advice, and to coordinate the Work with the Work of such parties so that the Project shall be completed in the most efficient and expeditious manner. In the event that Contractor's failure to efficiently sequence or coordinate the Work results in additional costs to the University, the Contractor shall promptly reimburse the University for the actual costs incurred. Contractor shall remain responsible for any delays resulting from its failure to efficiently coordinate and schedule the Work; any delays or extensions shall be addressed as provided in Sections 4.08, 4.09 and 4.10 of these General Conditions.

4.02.4 Quality Control

The Contractor shall be fully responsible for the quality of materials and workers' skill in the Project. The Contractor shall not rely upon the inspection and testing provided by the University or Design Professional other than those special inspections and tests performed at the University's direction for which there are written reports. Reports issued by the University's commissioning agent are to be considered complementary in nature and in no way relieve the Contractor of its responsibility to deliver Work in compliance with the Contract Documents.

The Contractor shall inspect the Work of the subcontractors on the Project, while the Work is being performed through final completion and acceptance of the Project by the University to assure that the Work performed and the materials furnished are in strict accordance with the drawings and specifications; the Contractor shall also inspect the Work to verify that Work on the Project is progressing on schedule.

The Contractor shall be responsible for inspection of portions of Work performed under this Contract to determine that such portions are in proper condition to receive subsequent Work. In the event that it becomes necessary to interpret the meaning and intent of the plans and specifications during construction and the meaning is not reasonably inferable, the Contractor shall submit as a Request for Information (RFI) to the Design Professional to make the interpretation in writing and transmit same to appropriate Subcontractors and the University in accordance with the procedures established in section 5.02 of these General Conditions.

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

4.02.5 Labor and Materials

The Contractor shall provide an analysis of the types and quantity of labor required for the Project and review the availability of the appropriate categories of labor required for all Work, and the Contractor shall be responsible to provide the necessary and adequate labor needed to complete the Project by the Contract Time. During the course of the Project, the Contractor shall endeavor to maintain harmonious labor relations on the Project.

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, , transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

Unless otherwise noted in the Information to Bidders, the Contractor shall provide and pay for water, heat, electric and other utilities.

The Contractor shall enforce strict discipline and good order among the Contractor's employees and Subcontractors and others carrying out the Work of the Contract. The Contractor shall not permit employment of unsafe persons or persons not skilled in tasks assigned to them.

4.02.6 Disputes with Subcontractors

Wherever any provision of any section of the Plans and Specifications conflicts with any agreement or regulation of any kind at any time in force among members of any Trade Associations, Unions or Councils which regulate or distinguish what Work shall or shall not be included in the Work of any particular trade, the Contractor shall make all necessary arrangements to reconcile any such conflict without delay, damage, increase to the Contract Sum or recourse to the University. The University will not arbitrate disputes among subcontractors nor between the Contractor and one or more subcontractors concerning responsibility for performing any part of the Project.

In case the progress of the Work is affected by any undue delay in furnishing or installing any items of material or equipment required under the Contract Documents because of conflict involving any agreement or regulation of the type described above, the University's Representative may require that other material or equipment of equal kind and quality be provided at no additional cost to the University.

4.02.7 Project Manager and Superintendent

The Contractor shall have at the Project site, during the full term of the Contract, an approved, competent project staff, which may include a Project Manager and Superintendent, and any necessary assistants, all satisfactory to the University's Representative and in accordance with the Contract Documents and the Contractor's Staffing Plan. The Project Manager or the Superintendent shall not be changed, except with the written consent of the University's Representative unless the Project Manager or the Superintendent ceases to be in the employ of the Contractor. The Project Manager or the Superintendent shall represent the Contractor and all directions given to either of them by the University or the University's Representative shall be as binding as if given to the Contractor. All directions and communications shall be confirmed in writing.

If a Project Manager or a Superintendent approved by the University's Representative ceases to be in the Contractor's employ, the Contractor shall immediately replace him with a person acceptable to the University's Representative. The University in its sole discretion shall have the right to require the removal of any agent or employee of the Contractor or any subcontractor without cause at any time.

4.02.8 Taxes

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

4.02.9 Permits and Notices

The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations, policies and lawful orders of public authorities and the University bearing on performance of the Work.

4.02.10 Allowances

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such stated amounts including identified unit cost, but the Contractor shall not be required to employ persons or entities against which the Contractor makes reasonable objection. Unless otherwise provided in the Contract Documents:

1. materials and equipment under an allowance shall be selected promptly by the University to avoid delay in the Work;
2. allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
3. the 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 allowances;
4. if allowance assumptions prove inappropriate, the Contract Sum may be adjusted accordingly by Change Order. The amount of the Change Order shall reflect the difference between actual costs and the allowances.

4.02.11 Use of Site

The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. The site shall be safely maintained and kept clean, orderly and neat.

4.02.12 Safety

The Contractor shall protect adjoining property and nearby buildings, roads, and other facilities and improvements from dust, dirt, debris and other nuisances arising out of Contractor's operations or storing practices. Dust shall be controlled by sprinkling, misting or other effective methods acceptable to University and in accordance with legal requirements. An erosion and sedimentation control program shall be initiated, which includes measures addressing erosion caused by wind and water and sediment in runoff from site. A regular watering program shall be initiated to adequately control the amount of fugitive dust.

The Contractor is knowledgeable of and understands that the University may intend to maintain occupancy of certain portions of the existing facility. The Contractor shall exercise caution at all times for the protection of persons and their property. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (1) employees on the Work site together with Subcontractors and other persons who may be affected thereby; (2) the Work and materials and equipment to be incorporated therein, whether in storage on or offsite, under care, custody or control of the Contractor or the Contractor's Subcontractors or sub-subcontractors; and (3) other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall install adequate safety guards and protective devices for all equipment and machinery, whether used in the Work or permanently installed as part of the Project.

The Contractor shall also provide and adequately maintain all proper temporary walks, roads, guards, railings, lights, and warning signs. The Contractor shall comply with all applicable laws relating to safety precautions. The Contractor shall establish and maintain and update as required a Project Specific Safety Program.

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

The Contractor shall require each and every one of its subcontractors and Trade Contractors to comply with all of the provisions of this section.

The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

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

4.02.13 Hazardous Condition

The University and/or the Design Professional may bring to the attention of the Contractor a possible hazardous situation in the field regarding the safety of personnel on the site. The Contractor shall be responsible for verifying that all local, state, and federal workplace safety guidelines are being observed. In no case shall this right to notify the Contractor absolve the Contractor of its responsibility for monitoring safety conditions. Such notification shall not imply that anyone other than the Contractor has assumed any responsibility for field safety operations.

Explosives shall not be used without first obtaining written permission from the University and then shall be used only with the utmost care and within the limitations set in the written permission and in accordance with prudence and safety standards required by law. Storage of explosives on the Project site or University is prohibited. Powder activated tools are not explosive for purposes of this Article; however, such tools shall only be used in conformance with State safety regulations.

The Contractor shall report in writing to the University's Representative, within eight (8) hours, all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether occurring on or off the Site, which caused death, personal injury or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the University Representative and the University Police at (313) 577-2222. If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall report promptly the facts in writing to the University's Representative, giving full details of the claim.

4.02.14 Cutting, Patching and Sequencing

The Contractor shall be responsible for all cutting, fitting or patching required to complete the Work and to ensure the complete and effective coordination of the Work.

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

4.02.15 Access to Site

The Contractor shall at all times permit the University and the Design Professional to visit and observe the Work, and the shops where Work is in preparation, and shall maintain proper facilities and provide safe access for such observation. Work requiring testing, observation or verification shall not be covered up without such test, observation, or approval. Appropriate advance coordination of such testing, observation or verification is expected. University must provide prior written approval for any work to be performed on a Saturday, Sunday, or holiday. In the event that Contractor desires to perform Work on a weekend or holiday, Contractor shall provide a minimum of 48 hours written notice to the University of such desire prior to performing such Work. However, if the Work involves an actual or potential interruption to a utility or service, the Contractor shall provide no less than seven (7) days' written notice to the University.

The Contractor acknowledges that during the performance of the Work, the affected building and surrounding campus buildings will remain occupied and will require access by the public. The Contractor further acknowledges that other Contractors will be working on or near the Project site to accomplish the University's purposes and projects. To the greatest extent possible, the Contractor shall cooperate fully with the University and its guests, students, employees, invitees, and other Contractors in performing the Work required under the Contract. The Contract Sum includes any and all reasonably necessary costs expended to minimize interference with the University's activities as well as to coordinate schedules with other contractors' projects as required by the University.

4.02.16 Burden for Damage

From the issuance of the official Notice to Proceed until the formal acceptance of the Project by the University, the Contractor shall have the charge and care of and shall bear all risk of damage to the Project

and materials and equipment for the Project other than damage directly caused by the University or the University's other contractors.

4.02.17 Payments by Contractor

The Contractor agrees to promptly pay all subcontractors upon receipt of each progress payment, unless otherwise agreed in writing by the parties, the respective amounts allowed Contractor on account of the Work performed by its subcontractors to the extent of each such subcontractor's interest therein.

In the event the University becomes informed that the Contractor has not paid a subcontractor as herein provided, the University shall have the right, but not the duty, to issue future checks in payment to the Contractor of amounts otherwise due hereunder naming the Contractor and such subcontractor as joint payees. Such joint check procedure, if employed by the University, shall create no rights in favor of any person or entity beyond the right of the named payees to payment of the check and shall not be deemed to commit or obligate the University to repeat the procedure in the future. This provision shall not supersede the procedures set forth in Article 8.00 of these General Conditions.

4.02.18 Responsibility to Secure and Pay for Permits, Licenses, Utility Connections, Etc.

The Contractor shall secure all permits and licenses required for any operations required under this Contract and shall pay all costs relating thereto as well as all other fees and charges that are required by the United States, the State, the county, the city, a public utility, telephone company, special district, or quasi-governmental entity. It is the responsibility of the Contractor to ascertain the necessity of such permits and licenses in preparing its bid, Contract Sum and include in its bid, Contract Sum the cost thereof, as well as any time requirements for securing such permits and licenses.

4.02.19 Patented or Copyrighted Materials

The Contractor shall pay all royalties and license fees for the use of patented or copyrighted processes or materials. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the University and Design Professional harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Design Professional and University in writing.

4.02.20 Property Rights in Materials and Equipment

Nothing in the Contract shall be construed as vesting in the Contractor any property right in the materials or equipment after the materials or equipment have been attached to or permanently placed in or upon the Work or the soil or after payment has been made for fifty percent or more of the value of the materials or equipment delivered to the site of the Work whether or not they have been so attached or placed. All such materials or equipment shall become the property of University upon being so attached or placed, or upon payment of fifty percent or more of the value of the materials or equipment delivered on the site but not yet installed and the Contractor warrants that all such property shall pass to the University free and clear of all liens, claims, security interests, or encumbrances.

4.02.21 Utilities

The Contractor shall refer to and abide by the policies included in the Supplementary General Conditions and shall provide the notices as required by University's Utility Disturbance and Interruption Request form.

The Contractor shall provide as-built drawings of all utilities encountered and constructed for the University, indicating the size, horizontal location, and vertical location based on the Project bench mark or a stable datum.

Unless otherwise specifically stated, the Contractor shall provide or otherwise make all arrangements for utilities required to deliver the Work. .

4.02.22 Asbestos and Hazardous Materials

The Contractor is prohibited from installing any asbestos containing materials or products, and other prohibited and hazardous materials in the Work. The Contractor shall be responsible for removal and replacement costs should it be determined this provision has been violated, regardless of whether the job has been completed.

4.02.23 Photographic Site Survey

Contractor shall perform a photographic survey of construction site and adjoining structures prior to commencing Work. The survey shall be provided to the University and shall include photographs of pathways, flat concrete paving, foundations, walls, landscaping.

4.02.24 Compliance with University Policies on Drugs, Alcohol and Tobacco.

The University requires Contractors, Subcontractors and sub-subcontractors with access to the work site to abide by the University's policies on drugs, alcohol and tobacco, which can be found at: http://bog.wayne.edu/2_20_04.php and <http://policies.wayne.edu/administrative/00-03-smoke-free-campus.php>. All costs for initial and period testing shall be borne by the Contractor

1. The Contractor and University shall reserve the right to test any and/or all site personnel at random periods and without notice.
 - a. The Contractor shall be responsible for all costs including wages for those individuals testing drug or alcohol-free at the Contractor's direction.
 - b. Subcontractors shall be responsible for all costs including wages for those individuals not testing drug or alcohol-free at the direction of the Contractor, and the Subcontractor shall immediately remove those individuals from the site.
2. Any individual not testing drug or alcohol-free shall not be allowed to return to the site under any circumstances.

4.03 Design Professional

4.03.1 Design Professional's Administration of Contract

The Design Professional will provide one or more Project Representatives to assist in the administration of the Contract as described in the Contract Documents, and to assist the University's Representative (1) during the construction, (2) until final payment is due and (3) with the University's concurrence, from time to time during the correction and warranty period. The Design Professional will advise and consult with the University on issues relating to contract performance and interpretation. The Design Professional will have no authority to act on behalf of the University except as provided in the Contract Documents, unless otherwise modified by written instrument in accordance with other provisions of the Contract.

The Design Professional will visit the site at intervals defined in the Design Professional's Proposal to become familiar with the progress and quality of the completed Work and to determine if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. On the basis of on-site observations, the Design Professional will keep the University and Contractor informed of progress of the Work by written field reports, and will endeavor to guard the University against defects and deficiencies in the Work.

The Design Professional will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Design Professional will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Design Professional will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

4.03.2 Communications Facilitating Contract Administration

The Design Professional and Contractor shall communicate directly concerning the Project and shall keep the University advised of their communications. Communications by and with the Design Professional's consultants shall be through the Design Professional. Communications by and with subcontractors and material suppliers shall be through the Contractor. Communications by and with separate Contractors shall be through the University.

4.03.3 Evaluation of Applications for Payment

Based on the Design Professional's observations and evaluations of the Contractor's Applications for Payment, the Design Professional must approve and sign any Contractor Applications for Payment as an express condition precedent to release of any progress or final payment. In the absence of Design Professional, the University will review and authorize applications for payment.

The Design Professional will have authority to reject Work which does not conform to the Contract Documents. Whenever the Design Professional considers it necessary or advisable for implementation of the intent of the Contract Documents, the Design Professional will have authority to require additional observation or testing of the Work in accordance with section 5.06, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Design Professional nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Design Professional to the Contractor, subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

4.03.4 Review of Shop Drawings, Product Data and Samples

The Design Professional shall review and approve or take other appropriate action upon the Contractor's submittal of Shop Drawings, Product Data and Samples. The Design Professional's action will be taken within 10 days from receipt so as not to cause delay in the Work or in the activities of the University, Contractor or separate Contractors, while allowing sufficient time in the Design Professional's professional judgment to permit adequate review. Review of such submittal is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Design Professional's review of the Contractor's submittal shall not relieve the Contractor of the obligations under Article 5.04. The Design Professional's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Design Professional, of any construction means, methods, techniques, sequences or procedures. The Design Professional's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.03.5 Site Observations to Determine Substantial and Final Completion

The Design Professional will conduct observations to determine the date or dates of Substantial Completion and the date of Final Completion, will receive and forward to the University for the University's review and retention all written warranties and related documents required by the Contract and assembled by the Contractor, and will issue an approval of final payment upon compliance with the requirements of the Contract Documents.

4.04 Delegation of Performance and Assignment of Money Earned

The performance of all or any part of this Contract may not be delegated by the Contractor or Design Professional without the written consent of the University. Consent will not be given to any proposed delegation which would relieve the Design Professional, the Contractor or its surety of their responsibilities under the Contract.

The Contractor may assign moneys due or to become due under the Contract, only upon written consent of the University. Assignments of moneys earned by the Contractor shall be subject to proper retention in favor of the University and to all deductions provided for in the Contract and such moneys shall be subject to being used by the University for the completion of the Work in the event the Contractor is in default. Any assignment attempted without the written consent of the University shall be void.

4.05 Contractor's Insurance

The Contractor shall not commence Work under this Contract until it has obtained all the insurance required by the Contract Documents and such insurance has been approved by the University; likewise, no subcontractor or subconsultant shall be allowed to commence Work until the insurance required has been obtained. The Contractor shall, at its expense, purchase and maintain in full force and effect such insurance as will protect itself and the University from claims, such as for bodily injury, death, and property damage, which may arise out of or result from the Work required by the Contract Documents, whether such Work is done by the Contractor, by any subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. The types of such insurance and any additional insurance requirements are specified herein with the amounts and limits set forth in the Supplementary General Conditions.

4.05.1 Policies and Coverage

The following policies and coverages shall be furnished by the Contractor:

- (1) Comprehensive or Commercial Form General Liability Insurance on an "Occurrence" form covering all Work done by or on behalf of the Contractor and providing insurance for bodily injury, personal injury, property damage, and Contractual liability. Except with respect to bodily injury and property damage included within the products and completed operations hazards, the aggregate limit shall apply separately to work required of the Contractor by these Contract Documents. This insurance shall include the contractual obligations assumed under the Contract Documents and specifically section 4.06.
- (2) Business Automobile Liability Insurance on an "Occurrence" form covering owned, hired, leased, and non-owned automobiles used by or on behalf of the Contractor and providing insurance for bodily injury, property damage, and Contractual liability.
- (3) Worker's Compensation and Employer's Liability Insurance as required by Federal and Michigan law. The Contractor shall also require all of its Subcontractors to maintain this insurance coverage. The Contractor acknowledges and shall abide by the University's prohibition on the use of 1099 independent contractors and owner/operator business entities wherein such individuals are not able

to secure and maintain such insurance. The Contractor shall ensure that all classifications of laborers and construction mechanics performing Work on the Project job site are traditional employees of the Contractor or any Trade Contractor for any tier thereof, and that each is covered by such insurance.

- (4) The Umbrella Excess Liability insurance must be consistent with and follow the form of the primary policies, except that Umbrella Excess Liability insurance shall not be required for the Medical Expense Limit.
- (5) Builder's Risk Insurance: The Contractor, at his sole expense, shall purchase and maintain property insurance upon the entire Project for the full replacement cost at the time of any loss. This insurance shall include "All Risk" coverage against physical loss or damage including the perils of Fire and Extended Coverage, Theft, Vandalism, and Malicious Mischief, Transit and Collapse. The Contractor will be responsible for any co-insurance penalties and/or deductibles.
- (6) Professional Liability (Errors and Omissions) including tail-coverage for claims made after final completion.

4.05.2 Proof of Coverage

Certificates of Insurance or Declarations pages as may be requested by the University, as evidence of the insurance required by these Contract Documents, shall be submitted by the Contractor to the University. The Certificates of Insurance and Declarations shall state the scope of coverage and deductible, and list the University as an additional insured as required by Section 4.05.04 below. Any deductible shall be the Contractor's liability. The Declarations shall provide for no cancellation or modification of coverage without thirty (30) days prior written notice to the University. Acceptance of Certificates of Insurance or Declarations pages by the University shall not in any way limit the Contractor's liabilities under the Contract Documents. The Contractor shall maintain required insurance for the entire duration of the Contract. In the event the Contractor does not comply with these insurance requirements, the University may, at its option, provide insurance coverage to protect the University; the cost of such insurance shall be deducted from the Contract Sum or otherwise paid by the Contractor. Renewal certifications shall be filed in a timely manner for all coverage until the Project is accepted as complete as requested by the University. Upon the University's request, the Contractor shall provide copies of the policies obtained from the insurers.

4.05.3 Subcontractor's Insurance

The Contractor shall either require Subcontractors to carry insurance as set forth in the CCIP Insurance Manual and the Subcontract, or the Contractor shall insure the activities of the Subcontractors in the amount, types and form of insurance required under by the Contract Documents. If the Contractor elects to have its Subcontractors purchase individual insurance policies, the Contractor shall cause its trade contracts and subcontracts to include a clause requiring that copies of any insurance policies which provide coverage to the Work shall be furnished to the University upon request. The Contractor shall supply the University with a list of all Subcontractors, including those enrolled in the CCIP coverage, and copies of the enrolled Subcontractors' certificates of insurance evidencing coverage, showing whether or not they have individual insurance policies and certifying that those subcontractors without individual insurance policies are insured by the Contractor.

4.05.4 Scope of Insurance Coverage

The Contractor's insurance as required by the Contract Documents (including subcontractors' insurance), by endorsement to the policies and the Certificates of Insurance, shall include the following and may be presented in the form of a rider attached to the Certificates of Insurance:

- (1) The Board of Governors of Wayne State University, the University, their officers, employees, representatives and agents including the Design Professional, shall be included as additional insured under the general liability, builder's risk and automobile liability policies for and relating to the Work to be performed by the Contractor and subcontractors. This shall apply to all claims, costs, injuries, or damages.
- (2) A Severability of Interest Clause stating that, "The term 'insured' is hereby used severally and not collectively, but the inclusion herein of more than one insured shall not operate to increase the limits of the insurer's or insurers' liability."
- (3) A Cross Liability Clause stating that, "In the event of claims being made under any of the coverages of the policy or policies referred to herein by one or more insured hereunder for which another or other insured hereunder may be liable, then the policy or policies shall cover such insured or insured against whom a claim is made or may be made in the same manner as if separate policies had been issued to each insured hereunder. Nothing contained herein, however, shall operate to increase the insurer's limits of liability as set forth in the insuring agreements."
- (4) The Board of Governors of Wayne State University, the University, their officers, employees, representatives and agents, shall not by reason of their inclusion as insured incur liability to the insurance carriers for payment of premiums for such insurance. However, the Board of Governors of Wayne State University may, in their sole discretion after receiving a notice of cancellation for nonpayment, elect to pay the premium due and deduct such payment from any sums due to the Contractor or recover the amount paid from the Contractor if the sums remaining are insufficient.
- (5) Coverage provided is primary and is not in excess of or contributing with any insurance or self-insurance maintained by the Board of Governors of Wayne State University, the University, their officers, employees, representatives and agents.

4.05.5 Miscellaneous Insurance Provisions

The form and substance of all insurance policies required to be obtained by the Contractor shall be subject to approval by the University. All such policies shall be issued by companies lawfully authorized to do business in Michigan and be acceptable to the University. All property insurance policies to be obtained by the Contractor shall name the University as loss payee as its interest, from time to time, may appear.

The Contractor shall, by mutual agreement with the University and at the University's cost, furnish any additional insurance as may be required by the University. The Contractor shall provide Certificates of Insurance evidencing such additional insurance.

Should the Project involve asbestos abatement, the Contractor or subcontractor, as appropriate, shall provide asbestos liability insurance.

The Contractor acknowledges that the University is self-insured and participates in the Michigan Universities Self-Insurance Corporation program and the Contractor agrees that the University is not required to provide or purchase any additional insurance with respect to this Project or the Work required by the Contractor for the Project.

4.05.6 Loss Adjustment

Any insured loss is to be adjusted with the Contractor and made payable jointly to the University and the Contractor. The Contractor shall cooperate with the University in a determination of the actual cash value or replacement value of any insured loss. Any deductible amount shall be the responsibility of the Contractor.

4.05.7 Compensation Distribution

The University upon the occurrence of an insured loss shall account for any money so received and shall distribute it in accordance with such agreement as the interested parties may reach. Claim payments received shall be distributed proportionately according to the actual percentages of losses to both. If after such loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate contract change order. Any dispute shall be resolved by the University.

4.05.8 Waivers of Subrogation

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

4.06 Indemnification

4.06.1

To the fullest extent permitted by law, the Contractor shall hold harmless, defend, and indemnify the Board of Governors of Wayne State University, the University, and officers, employees, representatives and agents of each of them, from and against any and all claims or losses arising out of or are alleged to be resulting from, or relating to (1) the failure of the Contractor to perform its obligations under the Contract or the performance of its obligation in a willful or negligent manner; (2) the inaccuracy of any representation or warranty by the Contractor given in accordance with or contained in the Contract Documents; and (3) any claim of damage or loss by any subcontractor, or supplier, or laborer against the University arising out of any alleged act or omission of the Contractor or any other subcontractor, or anyone directly or indirectly employed by the Contractor or any subcontractor.

4.06.2

To the fullest extent permitted by law, the Contractor shall be liable for and hereby agrees to defend, discharge, fully indemnify and hold the University harmless from and against any and all claims, demands, damages, liability, actions, causes of action, losses, judgments, costs and expenses of every nature (including investigation costs and/or expenses, settlement costs, and attorney fees and expenses incident thereto) sustained by or asserted against the University arising out of, resulting from, or attributable to the performance or nonperformance of any Work and/or obligation covered by the Contract or to be undertaken in connection with the construction of the Project contemplated by the Contract (collectively, "Claim"), including, but not limited to, any Claim for: (a) any personal or bodily injury, illness or disease, including death at any time resulting therefrom of any person, (including, but not limited to, employees of the University, the Contractor, any subcontractor, and any materialman and the general public); (b) any loss, damage or destruction of any property; (c) any loss or damage to the University's operations, arising out of, resulting from, or attributable in whole or in part to (i) any negligence or other act or omission of the Contractor, and any subcontractor, any materialman and/or any other person or any of the directors, officers, employees or agents of any of them or (ii) any defects in material or equipment furnished hereunder; (d) any payments

allegedly owed to subcontractors, sub-subcontractors or materialmen; (e) any acts or omissions relative to conditions of safety and protection of persons on the Project site; and/or (f) any act or omission relative to the Contractor's breach of obligations and regarding non-discrimination as set forth in these General Conditions. The Contractor shall not be liable hereunder to indemnify the University against liability for damages arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence or willful misconduct of the University, its agents or employees. The Contractor, at its own cost and expense, shall take out and maintain at all times during the effective period of the Contract, contractual liability insurance insuring the performance by the Contractor of its contractual duties and obligations under this Article, which insurance shall name the University as additional insured and shall be in form and amount and from an insurance company satisfactory to the University. The Contractor's duty to fully indemnify the University shall not be limited in any way by the existence of this insurance coverage.

4.06.3

The Contractor shall also be liable for and hereby agrees to pay, reimburse, fully indemnify and hold the University harmless from and against all costs and expenses of every nature (including attorney fees and expenses incident thereto) incurred by the University in collecting the amounts due from the Contractor, or otherwise enforcing its rights, under the indemnifications described in this Article.

4.06.4

In claims against any person or entity indemnified under this Article made by an employee of the Contractor or a subcontractor, or indirectly employed by either of them, or anyone for whose acts either made by liable, the indemnification obligation under this Article shall not be limited by any limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a subcontractor under workers compensation laws, disability benefit laws, or other laws providing employee benefits.

4.06.5

The indemnification obligations under this Article shall not be limited by any assertion or finding that the person or entity indemnified is liable by reason of a non-delegable duty.

4.06.6

The Contractor shall hold harmless, defend, and indemnify the University from and against losses resulting from any claim of damage made by any separate Contractor of the University against the University arising out of any alleged acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by either the Contractor or subcontractor, or anyone for whose acts either the Contractor or subcontractor may be liable.

4.06.7

The Contractor shall hold harmless, defend and indemnify the Design Professional and the separate Contractors of the University from and against losses to the extent they arise from the negligent acts or omissions or willful misconduct of the Contractor, a subcontractor, anyone directly or indirectly employed by the Contractor or subcontractor, or anyone for whose acts the Contractor or subcontractor may be liable.

4.07 Occupancy by University Prior to Acceptance

The University may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the University and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security,

maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a description of the area substantially complete to the Design Professional. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the University and Contractor or, if no agreement is reached, by decision of the Design Professional.

Immediately prior to such partial occupancy or use, the University together with the Contractor and Design Professional shall jointly observe and/or 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.

Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents. Likewise, partial occupancy or use of a portion or portions of the Work shall not alter, change or modify the requirements for Substantial or Final Completion within Contract Time.

4.08 Contract Time

4.08.1 Time of the Essence

All time limits specified in this Contract are of the essence of the Contract.

4.08.2 Starting and Completion Date

The University shall designate in the Notice to Proceed the starting date of the Contract on which the Contractor shall immediately begin and thereafter diligently prosecute the Work to completion. The Contractor agrees to complete the Work on the date specified for completion of the Contractor's performance in the Contract unless such time is adjusted, in writing, by change order issued by the University. The Contractor may complete the Work before the completion date if it will not interfere with the University or their other Contractors engaged in related or adjacent Work. The date of Substantial Completion shall be used as the commencement date of the guarantee.

4.08.3 Delay

Within ten (10) days from the commencement of a delay, Contractor shall submit to the University's Representative a written notice of the delay. Such notice of delay shall describe the nature and cause of the delay, provide a preliminary estimate of the impact of said delay on the construction schedule and provide a recovery plan to mitigate the delay. The Contractor's failure to give such notice to the University shall constitute a waiver by the Contractor of its ability to request an extension of time. In the case of a continuing cause of delay, only one claim shall be necessary. The giving of such notice shall not of itself establish the validity of the cause of delay or of the extension of the time for completion. Submission of reports and/or updates required at regularly scheduled meetings or as a part of a regularly submitted report shall not constitute such required notice.

The Contractor expressly agrees that delays to construction activities which do not affect the overall time of completion of the Work shall not entitle the Contractor to an extension of the Contract Time or provide a basis for additional cost or damages. No delay, obstruction, interference, hindrance, or disruption, from whatever source or cause in the progress of the Contractor's Work shall be a basis for an extension of time unless the delay, obstruction, interference, hindrance, or disruption is without the fault and not the responsibility of the Contractor and directly affects the overall completion of the Work as reflected in the Contractor's updated and accepted Project schedule.

Within fifteen (15) days from the submittal to the University of the notice of delay detailed in the previous paragraphs, Contractor shall submit to the University's Representative a request for an extension of time which shall include all documentation supporting the request. Such submittal shall include a detailed description of all changes in activity duration, logic, sequence, or otherwise in the Project schedule. The filing of such a request for an extension of time shall not of itself establish the validity of the cause of delay or of the extension of time for completion. Submission of construction reports and/or updates required by these General and Supplementary Conditions shall not constitute such a request.

4.08.4 Adjustment of Contract Time and Cost

If the Contractor is delayed, obstructed or hindered at any time in the progress of the Work by any act or neglect of the University or by any contractor employed by the University, or by changes ordered in the scope of the Work, or by fire, adverse weather conditions not reasonably anticipated, or any other causes beyond the control of the Contractor with the exception of labor disputes or strikes of the Contractor's or a Subcontractor's own personnel, then the duration set forth in the Master Project Schedule, and established for Substantial and Final Completion may be extended as agreed to by the University, Contractor and Design Professional. When such delays result in an agreement to adjust the Time of Completion, then the Contractor may also request, and the University may make a reasonable adjustment to the Contract Sum for Project costs directly attributable to the delay pursuant to Article 6.00, CHANGES IN THE WORK. It will be the Contractor's obligation to demonstrate to the complete satisfaction of the University, that the direct Project costs associated with such delays are justified, fair, and reasonable.

The University will not recognize labor disputes, strikes, work stoppages, picketing or boycotting by employees of or under the control or direction of the Contractor or its subcontractors, to be cause for extending the Construction Project Schedule or the Contract Time or adjusting the Contract Sum. The University may recognize labor disputes, strikes, work stoppages, picketing or boycotting that are not within the Contractor's or its subcontractors' control as cause for extending the Construction Project Schedule or Contract Time. Pursuant to section 9.01.1 such labor disputes, strikes, work stoppages, picketing or boycotts may constitute grounds for termination of the Contractor.

4.08.5 Contractor to Fully Prosecute Work

No extension of time will be granted unless the Contractor demonstrates to the satisfaction of the University that the Contractor has made every reasonable effort to complete all Work under the Contract not later than the date prescribed.

4.08.6 University's Adjustment of Contract Time

Even though the Contractor has no right to an extension of time for completion, the University may in the exercise of its sole discretion extend the time at the request of the Contractor if it determines it to be in the best interest of the University.

4.08.7 Adjustment of Contract Time and Cost Due to Reasons Beyond University Control

Should the University be prevented or enjoined from proceeding with Work either before or after the start of construction by reason of any litigation or other reason beyond its control, the Contractor may request an adjustment in the Time of Completion and/or Contract Sum by reason of said delay. The University may make a reasonable adjustment in the Time of Completion and/or Contract Sum for time and costs directly attributable to the delay. It will be the Contractors obligation to demonstrate to the complete satisfaction of the University, that all Time of Completion and Contract Sum adjustments associated with such delays are justified, fair, and reasonable.

4.09 Progress Schedule

4.09.1

The Contractor shall prepare and submit to the University the Contractor's Construction Schedule utilizing the Critical Path Method within ten (10) days after starting date on the Notice to Proceed. It shall be the Contractor's responsibility to use its best efforts and to act with due diligence to maintain the progress of the Work in accordance with the schedule. The time for completion may be extended only by a written Change Order executed by the University and the Contractor. The work activities making up the schedule shall be of sufficient detail to assure that adequate planning has been done for proper execution of the Work and such that, in the sole judgment of the University, it provides an appropriate basis for monitoring and evaluating the progress of the Work. The Construction Schedule shall include the time periods required for utility and service interruptions, including compliance with the notice periods stated in the Utility Disturbance and Disruption Request. The Contractor shall also submit a separate progress schedule listing all submittals required under the Contract and the date by which each submittal will be submitted allowing 10 days for the Design Professional's review ("submittal schedule").

4.09.4

Float, slack time, or contingency within the schedule at the activity level and total float within the overall schedule, is not for the exclusive use of either the University or the Contractor, but is jointly owned by both and is a resource available to and shared by both parties as needed to meet Contract milestones and the Contract completion date.

4.09.5

The Contractor shall not sequester shared float through such strategies as extending activity duration estimates to consume available float, using preferential logic, or using extensive crew/resource sequencing, etc. Since float time within the construction schedule is jointly owned, it is acknowledged that University caused delays on the Project may be offset by University caused time savings (i.e., critical path submittals returned in less time than allowed by the Contract, approval of substitution requests which result in a savings of time to the Contractor, etc.). In such an event, the Contractor shall not be entitled to receive a time extension until all University caused time savings are exceeded and the Contract completion date is also exceeded.

4.09.6

Regardless of which schedule method the Contractor elects to use in formulating the Contractor's Construction Schedule, an updated construction schedule shall be submitted to the University five (5) days prior to the submittal of the Contractor's monthly payment request. The submission of the updated construction schedule satisfying the requirements of this Article, accurately reflects the status of the Work, and incorporates all changes into the schedule, including actual dates, shall be a condition precedent to the processing of monthly payment applications. Updated schedules shall also be submitted at such other times as the University may direct. Upon approval of a change order or issuance of a direction to proceed with a change, the approved change shall be reflected in the next schedule update submitted by the Contractor.

4.09.7

If completion of any part of the Work, the delivery of equipment or materials, or issuance of the Contractor submittals is behind the updated Construction Schedule and will cause the end date of the Work to be later than the Contract completion date, the Contractor shall submit in writing a plan acceptable to the University for completing the Work on or before the current Contract completion date.

4.09.8

No time extensions shall be granted unless the delay can be clearly demonstrated by the Contractor on the basis of the updated Construction Schedule current as of the month the change is issued or the delay occurred, and the delay cannot be mitigated, offset, or eliminated through such actions as revising the intended sequence of Work or other means.

4.09.9

As a condition precedent to the release of retained funds, the Contractor shall, after completion of the Work has been achieved, submit a final Construction Schedule which accurately reflects the manner in which the Project was constructed and includes actual start and completion dates for all Work activities on the Project schedule together with a full and unconditional waiver and release of claims for payment in a form acceptable to the University.

4.10 Coordination With Other Work

The University reserves the right to do other Work in connection with the Project or adjacent thereto and the Contractor shall at all times conduct the Work so as to impose no hardship on the University or others engaged in the University's Work nor to cause any unreasonable delay or hindrance thereto.

Where two or more Contractors are employed on related or adjacent work, each shall conduct their operation in such a manner as not to cause delay or additional expense to the other.

The Contractor shall be responsible to others engaged in the related or adjacent work for all damage to Work, to persons and to property, and for loss caused by failure to complete the Work within the specified time for completion. The Contractor shall coordinate its Work with the Work of others so that no discrepancies shall result in the Project.

4.11 As-built Drawings Reflecting Actual Construction

During the course of construction, the Contractor shall maintain drawings kept up each day to show the Project as it is actually constructed. Every sheet of the plans and specifications which differs from the actual construction shall be marked and sheets so changed shall be noted on the title sheets of the plans and specifications. All change orders shall be shown by reference to sketch drawings, and any supplementary drawings or change order drawings shall be included. The Contractor shall review the "As-built" drawings with the University at least once a month to demonstrate that all changes that have occurred are being fully and accurately recorded. The altered Contract drawings shall be sufficiently detailed so that future Work on the Project or in adjacent areas may be conducted with a minimum of difficulty. Prior to the completion of the Project, and prior to release of the final retention payments, the "As-built" drawings and specifications shall be transmitted in hard copy and electronic format as directed by the University to the University or the Design Professional for further review. A copy of the transmittal shall be sent to the University and included in the formal Close-out documents.

4.12 Cleanup of Project and Site

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

If the Contractor fails to clean up as provided in the Contract Documents, the University may do so and the cost thereof shall be charged to the Contractor. Any additional cleaning requirements are as stated in the Supplementary General Conditions.

Upon completion of the Work, the Contractor shall promptly remove from the premises construction equipment and any waste materials not previously disposed of, leaving the premises thoroughly clean and ready for occupancy.

When two or more Contractors are engaged in work at or near the site, each shall be responsible for cleanup and removal of its own rubbish, equipment, and any waste materials not previously disposed.

In the event the Contractor does not maintain the Project or the site clear of debris and rubbish in a manner acceptable to the Design Professional or University, the University may, at its option, cause the Project or site to be properly cleaned and may withhold the incurred expense from payments due the Contractor or otherwise receive reimbursement from the Contractor.

4.13 [Not used]

4.14 Project Sign, Advertising

If included as a requirement in the project documents, Contractor shall furnish and install a project sign as designed by the Design Professional and accepted by the University as part of the Work under the Contract. As a minimum, the sign shall be four feet by eight feet, made from three-quarter inch plywood. The sign shall identify the Project name, the University including the individual members of the Board of Governors, the Design Professional, and the Contractor. No advertising is permitted on the Project or site without written permission from the University. If the Project is funded by a State of Michigan capital appropriation, the Contractor shall also provide a project sign which satisfies the requirements of the State of Michigan as stipulated in the Department of Technology Management and Budget's Major Project Design Manual, current edition.

5.00 INTERPRETATION OF AND ADHERENCE TO CONTRACT REQUIREMENTS

5.01 Interpretation of Contract Requirements

5.01.1 Conflicts

In the event of conflict in the Contract Documents, the priorities stated below shall govern:

- (1) Addenda shall govern over all other Contract Documents and subsequent addenda shall govern over prior addenda only to the extent that they modify prior addenda. Such addenda shall only govern the scope of Work, Contract Sum, and Time of Completion, and shall not be deemed to amend the Contract, General Conditions of Construction, or Supplementary General Conditions of Construction.
- (2) In case of conflict between plans and specifications, the specifications take precedence over drawings for the specific type or quality of materials or the quality of installation; the drawings take precedence over the specifications with regard to quantities, locations or detail of installation.
- (3) Conflicts within the plans:
 - (a) Schedules, when identified as such, shall govern over all other portions of the plans.
 - (b) Specific notes shall govern over all other notes and all other portions of the plans except the schedules described in Article 5.01.1, above.
 - (c) Larger scale drawings shall govern over smaller scale drawings.
 - (d) Figured or numerical dimensions shall govern over dimensions obtained by scaling. Scaling the drawings is prohibited.
- (4) Conflicts within the specifications:

“General Conditions for Construction” shall govern over all sections of the specifications except for specific modifications thereto that may be stated in Supplementary General Conditions or addenda. No other section of the specifications shall modify the General Conditions for Construction.
- (5) In the event provisions of codes, safety orders, Contract Documents, referenced manufacturer's specifications or industry standards are in conflict, the more restrictive or higher quality shall govern.

5.01.2 Omissions

If the Contract Documents are not complete as to any minor detail of a required construction system or with regard to the manner of combining or installing of parts, materials, or equipment, but there exists an accepted trade standard for good and skillful construction, such detail shall be deemed to be an implied requirement of the Contract Documents in accordance with such standard. “Minor Detail” shall include the concept of substantially identical components, where the price of each such component is small even though the aggregate cost or importance is substantial, and shall include a single component which is incidental, even though its cost or importance may be substantial.

The quality and quantity of the parts or material so supplied shall conform to trade standards and be compatible with the type, composition, strength, size, and profile of the parts of materials otherwise set forth in the Contract Documents.

5.01.3 Miscellaneous

Portions of the Work which can be best illustrated by the Drawings may not be included in the Specifications and portions best described by the Specifications may not be depicted on the Drawings.

If an item or system is either shown or specified, all material and equipment normally furnished with such items and needed to make a complete operating installation shall be provided whether mentioned or not, even though such materials and equipment are not shown on the drawings or described in the specifications, omitting only such parts as are specifically excepted. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

The General Conditions and Supplementary General Conditions are a part of each and every section of the Specifications.

All drawings, Project Plans and Specifications, renderings and models or other documentation, and copies thereof, furnished by the University or any agent, employee or consultant of the University, or Design Professional, are and shall remain the property of the University. They are to be used only with respect to this Project and are not to be used on any other project.

5.01.4 Interpreter of Documents

The University's Representative shall be the Interpreter, with the advice of the Design Professional, of the Contract Documents and shall be the judge of the performance of the Contractor and subcontractors. Subject to the provisions Article 7, claims, disputes and other matters of controversy relating to the Contract Documents or the Work shall be decided by the University's Representative. The decision of the University's Representative shall be final.

5.02 Issuance of Interpretations, Clarifications, Additional Instructions (Requests for Information)

Should the Contractor discover any conflicts, omissions, or errors in the Contract or have any question concerning interpretation or clarification of the Contract Documents, the Contractor shall request in writing an interpretation, clarification, or additional detailed instructions before proceeding with the Work affected. The written request shall be given to the Design Professional and University within 5 days of discovery.

The Design Professional, with review as required by the University, shall, within 10 days or other reasonable time, issue in writing the interpretation, clarification, or additional detailed instructions requested. In the event that the Contractor believes that the progress of the Work is being delayed by a Request for Information or a response to a Request for Information, Contractor shall comply with the procedures stated in section 4.08 of these General Conditions for an extension of time.

Should the Contractor proceed with the Work affected before receipt of the interpretation, clarification, or instructions from the Design Professional, the Contractor shall replace or adjust any Work not in conformance therewith and shall be responsible for any resultant damage or added cost.

Should any interpretation, clarification, or additional detailed instructions, in the opinion of the Contractor, constitute Work beyond the scope of the Contract, the Contractor must submit written notice thereof to the Design Professional and University within five (5) calendar days following receipt of such interpretation, clarification, or additional detailed instructions and in any event prior to commencement of Work thereon. The Contractor shall submit an explanation of how the interpretation, clarification, or additional detailed instruction constitutes work beyond the scope of the Contract, along with a detailed cost breakdown and an explanation of any delay impacts. The Design Professional shall consider such notice and make a recommendation to the University. If, in the judgment of the University, the notice is justified, the interpretation, clarification or additional detailed instructions shall either be revised or the extra work authorized by Contract change order or by field instruction with a change order to follow. If the University

decides that the request is not justified and the Contractor does not agree, the Contractor shall nevertheless perform such Work upon receipt from the University of written authorization to do so. In such case, the Contractor shall have the right to have the Claim later determined only pursuant to the requirements of this Contract. However, any such Claim for additional compensation because of such interpretation, clarification, or additional detailed instruction is waived, unless the Contractor gives written notice to the Design Professional and University within five (5) calendar days as specified above.

5.03 Product and Reference Standards

5.03.1 Product Designation

When descriptive catalog designations, including the manufacturer's name, product brand name, or model number are referred to in the Contract Documents, such designations shall be considered as being those found in industry publications of current issue at the date of Contract execution.

5.03.2 Reference Standards

When standards of the federal government, trade societies, or trade associations are referred to in the Contract Documents by specific date of issue, these shall be considered a part of this Contract. When such references do not bear a date of issue, the current and most recently published edition at the date of Contract execution shall be considered a part of this Contract.

5.04 Shop Drawings, Samples, Alternatives or Equals, Substitutions

5.04.1 Submittal Procedure

Shop drawings include drawings, diagrams, illustrations, schedules, performance charts, brochures and catalogs and other data prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor, and which illustrate some portion of the Work. In accordance with the submittal schedule, the Contractor shall promptly review and approve all shop drawings and then submit the shop drawings to the Design Professional together with samples as required by the Contract Documents and shall also submit any offers of alternatives or substitutions. The Design Professional shall have 10 days to respond with an acknowledgement of approval, clearly defined exceptions, or rejections. Rejections shall be cause for re-submission and no contract time adjustments will be granted for such requirements. At least six copies of brochures, one copy of shop drawings and one PDF digital file of shop drawings shall be submitted as well as additional copies as required by Design Professional. All such submittals shall be sent to Design Professional at the address given in the instructions to the Contractor at the job start meeting. A letter shall accompany the submitted items which shall contain a list of all matters submitted and shall identify all deviations shown in the shop drawings and samples from the requirements of the Contract Documents. Failure by the Contractor to identify all deviations may render void any action taken by the Design Professional on the materials submitted. Whether to void such action shall be in the discretion of the Design Professional. The letter and all items accompanying it shall be fully identified as to project name and location, the Contractor's name, and the University's Project number. By submitting the approved shop drawings and samples, the Contractor warrants and represents that the data contained therein have been verified with conditions as they actually exist and that the shop drawings and samples have been checked and coordinated with the Contract Documents.

5.04.2 Samples

Samples are physical examples furnished by the Contractor to illustrate materials, equipment, color, texture, or worker ship, and to establish standards by which the Work will be judged. Unless otherwise approved, at least two samples will be submitted for each item requiring samples to be submitted.

The Work shall be in accordance with the samples and reviewed by Design Professional. Samples shall be removed by the Contractor from the site when directed. Samples not removed by the Contractor, will become the property of the University and will be removed or disposed of by the University at the Contractor's expense.

5.04.2.1 Mock-ups as may be required by the Contract Documents

Mock-ups, models or temporary construction as may be required by the University shall be removed and disposed of by the Contractor at Contractor's sole cost and expense from the site when directed.

5.04.3

5.04.3 Substitutions

For convenience in designation on the plans or in the specifications, certain materials or equipment may be designated by a brand or trade name or the name of the manufacturer together with catalog designation or other identifying information, hereinafter referred to generically as "designated by brand name." Alternative material or equipment which is of equal quality and of the required characteristics for the purpose intended may be proposed for use provided the Contractor complies with the requirements stated in this section. If the Contractor proposes a product that is of lesser or greater quality or performance than the specified material or equipment, Contractor must both comply with the provisions of section 5.04 and submit any cost impact. The Contractor shall submit its proposal to University and the Design Professional for an alternative in writing within the time limit designated in the Contract, or if not so designated, then within a period which will cause no delay in the Work. By submitting a substitute, the Contractor waives any rights to claim a delay due to the processing of this substitution.

The Contractor may offer a substitution of a specified or indicated item if it presents complete information concerning the substitution and the benefits thereof to the University by reason of lower cost or improved performance, or both, over the specified or indicated item. However, such submission of a proposed substitution does not relieve the Contractor from its obligations under the Contract. In proposing a substitution, the Contractor warrants that the substitution is, at a minimum, equivalent in performance to the specified or indicated item. A substitution shall not be effective unless accepted in writing by the University.

Any additional costs and changes to the Work (including, but not limited to the Work of other Contractors and additional design costs which may be affected thereby) which may result from the proposed substitution shall be disclosed at the time the substitution is proposed to the University. Changes to the Work and any additional costs therefrom shall be the sole responsibility of the Contractor and shall not increase the Contract Sum.

The Contractor's substitution proposals shall include written descriptions of the items to be substituted (including drawings and/or specifications) and referenced information of the proposed substitution. The Design Professional and University's Representative's signature on this proposal is required for acceptance. Shop Drawings will not be considered a substitution proposal pursuant to this section. Verbal approvals or approved Shop Drawings will not be considered as acceptance of proposed substitutions.

5.05 Quality of Materials, Articles and Equipment

Materials, articles and equipment furnished by the Contractor for incorporation into the Work shall be new unless otherwise specified in the Contract Documents. When the Contract requires that materials, articles or equipment be furnished, but the quality or kind thereof is not specified, the Contractor shall furnish materials, articles or equipment at least equal to the kind or quality or both of materials, articles or equipment which are specified.

5.06 Testing Materials, Articles, Equipment and Work

Materials, articles, equipment or other Work requiring tests are specified in the Contract Documents. Materials, articles and equipment requiring tests shall be delivered to the site in ample time before intended use to allow for testing and shall not be used prior to testing and receipt of written approval. The Contractor shall be solely responsible for notifying the University where and when materials, articles, equipment and Work are ready for testing. Should any such materials, articles, equipment or Work be covered without testing and approval, if required, they shall be uncovered at the Contractor's expense. The University has the right to order the testing of any other materials, articles, equipment or Work at any time during the progress of the Work. Unless otherwise directed, all samples for testing shall be taken by the University from materials, articles or equipment to be used on the project or from Work performed. All tests will be under the supervision of, and at locations convenient to, the University. The University shall select the laboratories for all tests. Decisions regarding the adequacy of materials, articles, equipment or Work shall be issued to the University in writing. The University may decide to take further samples and tests, and if the results show that the Work was not defective, the University shall bear the costs of such samples and tests. In the event the results of such additional samples and tests show that the Work was defective, the Contractor shall bear the cost of such samples and tests. Samples that are of value after testing shall remain the property of the Contractor. All retesting and reinspection costs may be back charged to the Contractor by the University.

5.07 Rejection

Should any portion of the Work or any materials, articles or equipment delivered to the Project fail to comply with the requirements of the Contract Documents, such Work, materials, articles or equipment shall be rejected in writing and the Contractor shall immediately correct the deficiency to the satisfaction of the Design Professional and the University at no additional expense to the University. Any Work, materials, articles or equipment which is rejected shall immediately be removed from the premises at the expense of the Contractor. The University may retain one and one-fourth times the cost of the rejected materials, articles, equipment, and Work from any payments due the Contractor until such time as the deficiency is made acceptable to the Design Professional and University.

5.08 Responsibility for Quality

The testing and inspection provided by the University shall not relieve the Contractor of its responsibility for the quality of materials and workmanship provided by the Contractor, and the Contractor shall make good all defective Work discovered during or after completion of the Project.

6.00 CHANGES IN THE WORK

6.01 Change Orders

6.01.1 Generally

The University reserves the right to issue written orders whether through a formal Change Order or Preliminary Project Cost and Schedule Impact Report, directing changes in the Contract at any time prior to the acceptance of the Project without voiding the Contract, and Contractor shall promptly comply with such order or direction. The Contractor may request changes in the Work, but shall not act on the changes until approved in writing by the University. Any change made without authority in writing from the University shall be the responsibility of the Contractor.

Any such changes in the Work that have a cost impact shall only be authorized by Change Orders approved by the University. No action, conduct, omission, prior failure or course of dealing by the University shall act to waive, modify, change or alter the requirement that Change Orders must be in writing and signed by the University and Contractor and that such written Change Orders are the exclusive method for changing or altering the Contract Sum or Contract Time. The University and Contractor understand and agree that the Contract Sum and Contract Time cannot be changed by implication, oral agreements, actions, inactions, course of conduct or Preliminary Project Cost and Schedule Impact Report.

On the basis set forth herein, the Contract Sum may be adjusted for any Change Order requiring a different quantity or quality of labor, materials or equipment from that originally required, and the partial payments to the Contractor, set forth in section 8.01, may be adjusted to reflect the change. Whenever the necessity for a change arises, and when so ordered by the University in writing, the Contractor shall take all necessary steps to mitigate the effect of the ultimate change on the other Work in the area of the change. Changed Work shall be performed in accordance with the original Contract requirements except as modified by the Change Order. Except as herein provided, the Contractor shall have no claim for any other compensation including lost productivity or increased overhead expenses due to changes in the Work.

6.01.2 Proposed Change Orders

The Design Professional, with approval of the University, shall issue to the Contractor a cost request Bulletin for a proposed change order describing the intended change and shall require the Contractor to indicate thereon a proposed amount to be added to or subtracted from the Contract Sum due to the change supported by a detailed estimate of cost. Upon request by the University, the Contractor shall permit inspection of the original Contract estimate, Trade Contract agreements, or purchase orders relating to the change. Any request for adjustment in Contract Time which is directly attributable to the changed Work shall be included with substantiating detailed explanation by the Contractor in its response to the cost request bulletin. Failure by Contractor to request adjustment of Contract Time on the response to the cost request Bulletin shall waive any right to subsequently claim an adjustment of the Contract Time based on the changed Work. The Contractor shall submit the response to the cost request Bulletin with detailed estimates and any time extension request thereon to the Design Professional within ten (10) days after issuance of the cost request Bulletin. Upon its submission, the Design Professional will review it and advise the University who will make the decision regarding the request. The University retains sole discretion to accept, reject, or modify the proposed change. If the Contractor fails to submit the response within the required ten (10) days, and the Contractor has not obtained the Design Professional's and the University's permission for a delay in submission, the University may order the Contractor in writing to begin the Work immediately, and the Contract Sum shall be adjusted in accordance with the University's estimate of cost. In that event, the Contractor, within fifteen days following completion of the changed Work, may present information to the University that the University's estimate was in error; the University, in its sole discretion, may adjust the Contract Sum. The Contractor must keep and submit to the University time and materials records verified by the University to substantiate its costs. The University may require the Contractor to proceed immediately

with the changed Work in accordance with section 6.01.4, "Failure to Agree as to Cost" or section 6.02 "Emergency Changes."

When the University and the Contractor agree on the amount to be added to or deducted from the Contract Sum and the time to be added to or deducted from the Contract Time and a Contract Change Order is signed by the University and the Contractor, the Contractor shall proceed with the changed Work. If agreement is reached as to the adjustment in compensation for the performance of changed Work but agreement is not reached as to the time adjustment for such Work, the Contractor shall proceed with the Work at the agreed price, reserving the right to further pursue its Claim for a time adjustment. Any costs incurred to acquire information relative to a proposed Change Order shall not be borne by the University.

6.01.3 Allowable Costs Upon Change Orders

The identification of and manner in which costs will be allowed because of changed Work shall be computed as described by this section.

6.01.3.1 Labor

Costs are allowed for the actual payroll cost to the Contractor for direct labor, engineering or technical services directly required for the performance of the changed Work, (but not site management such as field office estimating, clerical, project engineering, management or supervision) including payments, assessments, or benefits required by lawful labor union collective bargaining agreements, compensation insurance payments, contributions made to the State pursuant to the Unemployment Insurance Code, and for taxes paid to the federal government required by the Social Security Act of 1935, as amended, unless the time of completion adjustments affect the general condition inclusion of the Contract Sum.

No labor cost will be recognized at a rate that deviates from the WSU Wages in the locality of Wayne County, Michigan as provided by the University at the time the Work is performed, or of wage and benefit rates associated with trade union collective bargaining agreements prevailing at the time of the change, and the use of a classification which would increase the labor cost may not be permitted unless the Contractor established to the satisfaction of the University the necessity for payment at a higher rate.

6.01.3.2 Materials

Costs are allowed for the actual cost to the Contractor for the materials directly required for the performance of the changed Work. Such cost of materials may include the costs of transportation, sales tax, and delivery if necessarily incurred. However, overhead costs shall not be included. If a trade discount by the actual supplier is available to the Contractor, it shall be credited to the University. If the materials are obtained from a supply or source owned wholly or in part by the Contractor, payment therefor will not exceed the current wholesale price for such materials.

If, in the opinion of the University, the cost of materials is excessive, or if the Contractor fails to furnish satisfactory evidence of the cost from the actual suppliers thereof, then in either case the cost of the materials shall be deemed to be the lowest wholesale price at which similar materials are available in the quantities required at the time they were needed.

6.01.3.3 Equipment

Costs are allowed for the actual cost to the Contractor for the use of equipment directly required in the performance of the changed Work except that no payment will be made for time while equipment is inoperative due to breakdowns or for non-working days. The total rental cost shall not exceed seventy-five percent (75%) of the market value of the rented equipment. The rental time shall include the time required to move the equipment to the Project site from the nearest available source for rental of such equipment, and to return it to the source. If such equipment is not moved by its own power, then loading and transportation

costs will be paid. However, neither moving time nor loading and transportation costs will be paid if the equipment is used on the Project in any other way than upon the changed Work. Individual pieces of equipment having a replacement value of \$500.00 or less shall be considered to be tools or small equipment, and no payment therefor will be made.

For equipment owned or furnished by the Contractor, no cost therefor shall be recognized in excess of the rental rates established by distributors or equipment rental agencies in the locality where the Work is performed. Blue Book rates shall not be used for any purpose.

The amount to be paid to the Contractor for the use of equipment as set forth above shall constitute full compensation to the Contractor for the cost of fuel, power, oil, lubrication, supplies, small tools, small equipment, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor (except for equipment operators who shall be paid for as provided in Article 6.01.3.1) and any and all costs to the Contractor incidental to the use of such equipment.

6.01.3.4 Change Order Mark-up Allowance

For Change Order scope whose cost is derived according to the Cost of Work plus a Fee as defined in 6.01.3.1 through 6.01.3.3, the mark-up allowance shall be as defined in the Contract. Lump-sum conditions shall include the mark-up allowance. When agreement as to cost cannot be reached, the Contractor shall execute the Work according to time and materials with the Contractor and University acknowledging such costs by signature on a daily basis, and as set forth below.

6.01.3.5 Credit for Deleted Work

For proposed change orders which involve both added and deleted Work, the Contractor shall separately estimate the cost of the added Work before mark-ups, and separately estimate the cost of the deleted Work before allowance of a credit. If the difference between the costs results in an increase to the Contract Sum, the mark-up for added Work shall be applied to the difference, and if the difference in the costs results in a decrease, then the mark-up for deleted Work shall be applied to the difference.

6.01.3.6 Market Values

Cost for added Work shall be no more than market values prevailing at the time of the change, unless the Contractor can establish to the satisfaction of the University that it investigated all possible means of obtaining Work at prevailing market values and that the excess cost could not be avoided.

When a change order deletes Work from the Contract, the computation of the cost thereof shall be the values which prevailed at the time bids for the Work were opened or the Contract Sum established.

6.01.4 Failure to Agree as to Cost

6.01.4.1 For Added Work

Notwithstanding the failure of the University and the Contractor to agree as to the cost of the proposed Change Order, the Contractor, upon written order from the University, shall proceed immediately with the changed Work. A Preliminary Project Cost and Schedule Impact Report or letter signed by the University shall be used for this written order. At the start of each day's Work on the change, the Contractor shall notify the University in writing as to the size of the labor force to be used for the changed Work and its location. Failure to so notify may result in the non-acceptance of the costs for that day. At the completion of each day's Work, the Contractor shall furnish to the University a detailed summary of all labor, materials, and equipment employed in the changed Work. The University will compare his/her records with Contractor's daily summary and may make any necessary adjustments to the summary. After the University and the Contractor agree upon and sign the daily summary, the summary shall become the basis for determining

costs for the additional Work. The sum of these costs when added to an appropriate mark-up will constitute the payment for the changed Work. Subsequent adjustments, however, may be made based on later audits by the University. When changed Work is performed at locations away from the job site, the Contractor shall furnish in lieu of the daily summary, a summary submitted at the completion of the Work containing a detailed statement of labor, material, and equipment used in the Work. This latter summary shall be signed by the Contractor who shall certify thereon that the information is true.

The Contractor shall maintain and furnish on demand of the University itemized statements of cost from all vendors and subcontractors who perform changed Work or furnish materials and equipment for such Work. All statements must be signed by the vendors and the subcontractors.

6.01.4.2 For Deleted Work

When a proposed Change Order contains a deletion of any Work, and the University and the Contractor are unable to agree upon the cost thereof, the University's estimate shall be deducted from the Contract Sum and may be withheld from any payment due the Contractor until the Contractor presents adequate substantial information to the University that the University's estimate was in error. The amount to be deducted shall be the actual costs to the Contractor for labor, materials, and equipment which would have been used on the deleted Work together with an amount for mark-up as defined in the Contract Documents.

6.01.5 Allowable Time Extensions

For any change in the Work, the Contractor shall only be entitled to such adjustments in Contract Time due solely to performance of the changed Work. The procedure for obtaining an extension of time is set forth in Section 4.08 of these General Conditions. No extension of time shall be granted for a change in the Work unless the Contractor demonstrates to the satisfaction of the University that the Work is on the critical path and submits an updated Critical Path Method schedule showing that an extension of time is required and that the Contractor is making, or has made, every reasonable effort to guarantee completion of the additional Work called for by the change within the time originally allotted for the Contract. Failure by the Contractor to make the required submission or showing constitutes a waiver of any possible adjustment in Contract Time.

Any adjustment in Contract time shall specify the exact impact on the date of Substantial Completion and Final Completion.

6.02 Emergency Changes

Changes in the Work made necessary due to unforeseen site conditions, discovery of errors in plans or specifications requiring immediate clarification in order to avoid a serious Work stoppage, changes of a kind where the extent cannot be determined until completed, or under any circumstances whatsoever when deemed necessary by the University are kinds of emergency changes which may be authorized by the University in writing to the Contractor. The Contractor shall commence performance of the emergency change immediately upon receipt of Preliminary Project Cost and Schedule Impact Report issued by the University.

If agreement is reached as to compensation adjustment for the purpose of any emergency change, then compensation will be as provided in this section relating to ordinary changes. If agreement is not reached as to compensation at the time of commencing the emergency change, then compensation will be as provided in section 6.01.4, that is, time and materials records and summaries shall be witnessed and maintained until either a lump sum payment is agreed upon, or the changed Work is completed.

6.03 Preliminary Project Cost and Schedule Impact Report

The Contractor shall perform Work as directed by the University through a Preliminary Project Cost and Schedule Impact Report. The cost of the changed Work is to be determined as stated in the Preliminary Project Cost and Schedule Impact Report or pursuant to section 6.01.4.

7.00 CLAIMS AND DISPUTES

7.01 Policy of Cooperation

The parties shall endeavor to resolve all of their claims and disputes amicably and informally through open communication and discussion of all issues relating to the Project. To the greatest extent possible, the parties shall avoid invoking the formal dispute resolution procedures contained in the Contract Documents.

7.02 Recommendation of Design Professional

Claims, including those alleging an error or omission by the Design Professional, must be referred initially to the Design Professional for action as provided in paragraph 7.09 as an express condition precedent to proceeding further in resolving any claim.

7.03 Time Limits on Claims

Claims must be made within 5 days after occurrence of the event giving rise to such Claim or within 5 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been resolved by Change Order will not be valid.

7.04 Continuing Contract Performance

Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the University shall continue to make payments in accordance with the Contract Documents subject to the University's rights relative to payments, withholding of payments, termination, or all other rights afforded it in the Contract Documents.

7.05 Claims for Concealed or Unknown Conditions

If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then written notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 48 hours after first observance of the conditions. The Design Professional will promptly investigate such conditions and, if the conditions differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, the Design Professional will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Design Professional determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Design Professional shall so notify the University and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 10 days after the Design Professional has issued such determination. If the University and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Design Professional for initial determination, subject to further proceedings pursuant to Paragraph 7.09.

7.06 Claims for Additional Cost

Any Claim by the Contractor for an increase in the Contract Sum shall be submitted in writing as required by the Contract Documents before proceeding to execute the Work. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Design Professional, (2) an order by the University to stop the Work where the Contractor was not at fault, (3) a

written order for a minor change in the Work issued by the Design Professional, (4) failure of payment by the University, (5) termination of the Contract by the University, (6) University's suspension or (7) changes in the scope of Work, the Contractor's claim shall be filed in strict accordance with the procedure established herein.

7.07 Claims for Additional Time

Any Claim by Contractor for an increase in the Contract Time shall be submitted in writing as required by the Contract Documents. The Contractor's Claim shall include an estimate of the probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

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

7.08 Injury or Damage to Person or Property

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 5 days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in the Contract Documents.

7.09 Resolution of Claims and Disputes

7.09.1 Review by Design Professional

Design Professional will review all Claims and take one or more of the following preliminary actions within 10 days of receipt of a Claim: (1) request additional supporting data from the Claimant, (2) submit a schedule to the parties indicating when the Design Professional expects take action, (3) reject the Claim in whole or in part, stating reasons for rejection, (4) recommend approval of the Claim by the other party or (5) suggest a compromise. The Design Professional may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

If a Claim has been resolved, the Design Professional will prepare or obtain appropriate documentation. If a Claim has not been resolved, the party making the Claim shall, within 10 days after the Design Professional's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested by the Design Professional, (2) modify the initial Claim or (3) notify the Design Professional that the initial Claim stands.

If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Design Professional, the Design Professional will notify the parties in writing that the Design Professional's opinion will be rendered within 5 days. Upon expiration of such time period, the Design Professional will render to the parties the Design Professional's determination relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Design Professional may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy. The determination by the Design Professional shall be subject to the review and approval of the Associate Vice President of Facilities Planning and Management at Wayne State University.

7.09.2 Review by Associate Vice President of Facilities Planning and Management

The determination by the Design Professional shall be subject to the review and approval of the Associate Vice President of Facilities Planning and Management at Wayne State University who may request additional information from the Claimant for review and consideration. The Associate Vice President of Facilities Planning and Management may issue a schedule for further discussions, review or decision. Upon decision by the Associate Vice President of Facilities Planning and Management, if the Claimant seeks further review, the matter shall be submitted to the Vice-President of Finance and Business Operations.

7.09.3 Review Vice-President of Finance and Business Operations

If the determination by the Design Professional and the decision of the Associate Vice President does not resolve the Claim, the Claimant may appeal to the Vice President of Finance and Business Operations who shall review such determination and the supporting information submitted by the parties for the purpose of upholding, modifying, or rejecting the determination. The Vice President of Finance and Business Operations shall render a decision within forty-five days of the completion of any submissions by the parties. The decision of the Vice President of Finance and Business Operations is final unless it is challenged by either party by filing a lawsuit in the Court of Claims of the State of Michigan within one year of the issuance of the decision.

7.09.4 Jurisdiction

Sole and exclusive jurisdiction over all claims, disputes, and other matters in question arising out of or relating to this Contract or the breach thereof, shall rest in the Court of Claims of the State of Michigan. No provision of this agreement may be construed as the University's consent to submit any claim, dispute or other matter in question for dispute resolution pursuant to any arbitration or mediation process, whether or not provisions for dispute resolution are included in a document which has been incorporated by reference into this agreement.

7.09.5 Condition Precedent

The process and procedures described in Article 7.09 are an express condition precedent to the Contractor filing or pursuing any legal remedy, including litigation. Pursuing litigation by the Contractor prior to exhaustion of the procedures set forth herein shall be premature and a material breach of this Agreement.

8.00 PAYMENT AND COMPLETION

8.01 Progress Payments

To assist in computing partial payments, the Contractor shall submit to the Design Professional and University a detailed "Schedule of Values" for review and approval by the University. The cost breakdowns shall be in sufficient detail for use in estimating the Work to be completed each month and shall be submitted within 10 days after the date of commencement of Work given in the Notice to Proceed.

Once each month during the progress of the Work, the Contractor shall submit to the Design Professional a partial payment request for review and approval. The partial payment request shall be based on the cost of the Work completed plus the acceptable materials delivered to or stored on the site under the control of the Contractor and not yet installed. The Design Professional and University shall review and certify by signature as to the validity of the request, and approving payment. Partial payments shall not be construed as acceptance of any Work which is not in accordance with the requirements of the Contract. Once the partial payment request has been certified by the Design Professional, it shall be submitted to the University for approval and processing.

The Contractor warrants that title to the Work, materials and equipment covered by an Application for Payment shall pass to the University upon the earlier of either incorporation in construction or receipt of payment by Contractor; that Work, materials and equipment covered by previous Applications for Payment are free and clear of liens, claims, security interests or encumbrances; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by Contractor or by any other person performing Work at the Project or furnishing materials or equipment for the Project subject to an agreement under which an interest or encumbrance is retained by the seller or otherwise imposed on the Contractor or buyer.

All Applications for Payment shall be accompanied by sworn statements and waivers executed by Contractor, Subcontractors and suppliers whose work is included in the Application for Payment, as well as other documentation that may be required by the University, stating that all have been paid in full for Work performed through the last or most recent progress payment: The Contractor and each subcontractor shall also provide properly completed certified payroll form WH-347 to the University's with each application for payment request.

8.02 Format of Application for Payment

In addition to a schedule of values or detailed outline for the Cost of Work that is acceptable to the Contractor and University, other specific requirements for Application for Payment format and calculations include.

- Applications for Payment shall first present the itemized Cost of Work.
 - For any portion of the Work being performed according to unit pricing or time and materials pricing, invoicing and Applications for Payment must be accompanied by acceptable supporting documentation to evidence accurate quantities of actual labor, materials and equipment. Any allowed mark-ups to the actual cost of Work performed will be added to these costs separately and not included in the actual cost.
 - Change Orders executed between the Contractor and University shall be reported as separate line items within the Application for Payment and directly under applicable Subcontractor Cost of Work items. Change Orders affecting multiple Subcontractors' Cost of Work items shall be similarly numbered to permit ease of tracking. These requirements shall run through Subcontractor Applications for Payment to the Contractor to permit ease of tracking. Change Orders within a Subcontractor Application for Payment shall be appropriately labeled as being initiated by the Contractor or University to permit ease of tracking.

- The Contractor's General Conditions, Overhead and Profit shall next be calculated as the balance of the Application for Payment.

8.03 Substantial Completion, Incomplete Construction List and Punchlist

When the Contractor considers that the Work, or a portion thereof which the University agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Design Professional a comprehensive Incomplete Construction List of items to be completed or corrected, in a form agreed by the University and the Design Professional. The Contractor shall proceed promptly to complete and correct items on the Incomplete Construction List. Failure to include an item on such Incomplete Construction List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the Contractor's Incomplete Construction List, the Design Professional, with the University's Representative, will make an observation to determine whether the Work or designated portion thereof is substantially complete and will identify observable items inconsistent with the Contract Documents to be included in the Punchlist. If the Design Professional's or University Representative's observation discloses any item, whether or not included on the Contractor's Incomplete Construction List, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item, upon notification by the Design Professional.

The Contractor shall then submit a request for another observation by the Design Professional to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Design Professional will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the University and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time, generally 45 days, within which the Contractor shall finish all remaining Incomplete Construction List and Punchlist items accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the University and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

8.03.1 Partial Completion

From time to time, as portions of the Work are completed by the Contractor, the University shall have the right, upon giving the Contractor prior written notice, to accept any portion of the Work that the University desires to use and occupy. Such partial acceptance shall be made in writing and thereafter the Contractor shall have no further obligation with respect to the Work accepted, except to correct the Work subsequently found to have been improperly done, to replace defective materials or equipment, or as defined by Substantial Completion, Incomplete Construction List and Punchlist requirements.

8.04 Completion and Final Payment

Upon the Final Completion of the Work by the Contractor, the acceptance of the Work by the University, and the release of all claims against the University and the Work by the Contractor and its subcontractors and suppliers (which releases shall be evidenced by final waivers and releases or other documents acceptable to the University), the Contractor shall file a request for Final Payment.

8.04.1 Final Application for Payment

Upon the receipt of the Contractor's Final Application for Payment, including any and all waivers required by the University and the Contractor's provision of all Close-out Documents, and training requirements, the University shall promptly make a final inspection, and if the University finds the Work acceptable and complete in strict accordance with the Contract Documents, the University shall issue Final Payment. Final

Payment shall be made upon Completion of the Work and shall indicate the University's Final Acceptance of the Work and its acknowledgment that the Work (excluding any further warranty and guaranty obligations) has been completed and is accepted under the terms and conditions of the Contract Documents. If prior to the making of Final Payment the University finds deficiencies in the Work, the University shall promptly notify the Contractor thereof in writing, describing such deficiencies in detail. After the Contractor has remedied any deficiencies noted by the University, the Contractor shall request a final inspection and the University shall make such inspection and follow the procedure set forth in this Paragraph.

8.04.2 Final Payment by the University

The making of Final Payment shall constitute a waiver of all claims by the University except those arising from: (1) unsettled liens; (2) faulty or defective work appearing after completion; (3) failure of the work to comply with the requirements of the Contract Documents; (4) terms of any special or extended warranties required by the Contract Documents; or (5) the obligations of the Contractor under the indemnification provisions of Paragraph 4.06 hereof.

The acceptance of Final Payment shall constitute a waiver of all claims by the Contractor.

8.05 Guarantee

The Contractor unconditionally guarantees the Work under this Contract to be in conformance with the Contract Documents and to be and remain free of defects in workmanship and materials not inherent in the quality required or permitted for a period required by the contract documents beginning from the date of Substantial Completion. The Subcontractors unconditionally guaranty the Work under the subcontracts to be in conformance with the Contract Documents and to be and remain free of defects in workmanship and materials for the same period from the date of Substantial Completion, unless a longer guarantee period is stipulated in the Contract Documents. By this guarantee the Contractor and Subcontractors agree, within their respective guarantee periods, to repair or replace any Work, together with any adjacent Work which may be displaced in so doing which is not in accordance with the requirements of the Contract or which is defective in its workmanship or material, all without any expense whatsoever to the University. The Contractor shall be responsible for the coordination of all such guarantee work performance or repairs.

Special guarantees that are required by the Contract Documents shall be signed by the Contractor or Subcontractor who performs the work.

Within their respective guaranty periods, the Contractor and Subcontractors further agree that within five calendar days after being notified in writing by the University of any Work not in accordance with the requirements of the Contract Documents or of any defects in the Work, it shall commence and prosecute with due diligence all Work necessary to fulfill the terms of this guarantee and to complete the Work in accordance with the requirements of the Contract with sufficient manpower and material to complete the repairs as expeditiously as possible. The Contractor, in the event of failure to so comply, does hereby authorize the University to proceed to have the Work done at the Contractor's expense, and it agrees to pay the cost thereof upon demand. The University shall be entitled to reimbursement of all costs necessarily incurred upon the Contractor's or Subcontractor's refusal to pay the above cost.

Notwithstanding the foregoing paragraph, in the event of an emergency constituting an immediate hazard to health, safety or damage of the University's employees, property, or licenses, the University may undertake at the Contractor's or Subcontractor's respective expense, without prior notice, all Work necessary to correct such hazardous conditions caused by the Work of the Contractor not being in accordance with the requirements of this Contract.

The Contractor and Subcontractor shall require a similar guarantee in all subcontracts, including the requirement that the University be reimbursed for any damage or loss to the Work or to other Work resulting from such defects.

9.00 TERMINATION

9.01 Termination by the University for Cause

9.01.1

The University may terminate the Contract if the Contractor: (a) becomes insolvent; (b) files or has filed against it any Petition in Bankruptcy or makes a general assignment for the benefit of its creditors; (c) fails to pay, when due, for materials, supplies, labor, or other items purchased or used in connection with the Work; (d) refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will ensure the completion of the Work in accordance with the Master Project Schedule; (e) in the University's opinion, fails, refuses or neglects to supply sufficient labor, material or supervision in the prosecution of the Work; (f) interferes with or disrupts, or threatens to interfere with or disrupt the operations of the University, or any other Contractor, supplier, subcontractor, or other person working on the Project, whether by reason of any labor dispute, picketing, boycotting or by any other reason; or (g) commits any other breach of the Contract Documents.

When any of the above reasons exist, the University may, without prejudice to any other rights or remedies of the University and after giving the Contractor and the Contractor's surety, if any, three days written notice and a reasonable opportunity to cure, terminate employment of the Contractor and may, subject to any prior rights of the surety: (1) take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor; (2) accept assignment of subcontracts; and (3) finish the Work by whatever reasonable method the University may deem expedient.

9.01.2

If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Design Professional's services and expenses made necessary thereby, the remaining balance shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the University. The amount to be paid to the Contractor or University, as the case may be, shall be certified by the Design Professional, upon application, and this obligation for payment shall survive termination of the Contract. The Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss or consequential damages arising out of or resulting from such termination. However, the University shall be entitled to retain whatever amount is remaining unpaid to the Contractor in order to correct the cause for termination; such action is in addition to any other right or remedy which the University may have.

9.02 Suspension by the University for Convenience

9.02.1

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

9.02.2

An adjustment shall be made for increases in the Contract Sum and/or Time of Completion of the Contract, including profit on the increased cost of performance, caused by suspension, delay or interruption. No adjustment shall be made to the extent: (1) that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or (2) that an equitable

adjustment is made or denied under another provision of this Contract. The Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss or consequential damages arising out of or resulting from such termination.

Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

9.03 Termination By The University For Convenience

9.03.1

The University, with or without cause, may terminate all or any portion of the services by the Contractor under this Agreement, upon giving the Contractor 30 days written notice of such termination. In the event of termination, the Contractor shall deliver to the University all reports, estimates, schedules, subcontracts, Contract assignments, purchase order assignments, and other documents and data prepared by it, or for it, pursuant to this Agreement.

9.03.2

Unless the termination is for cause, the Contractor shall be entitled to receive only the payments provided for in Article 8, pro-rated to the date of termination (including payment for the period of the 30 day notice) plus reimbursement for approved and actual costs and expenses incurred by the Contractor to the date of termination. Prior to payment, the Contractor shall furnish the University with a release of all claims against the University. The Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss or consequential damages arising out of or resulting from such termination.

9.04 Termination By The Contractor

9.04.1

The Contractor may terminate the Contract if the Work is stopped for a period of 60 days through no act or fault of the Contractor or a subcontractor, sub-subcontractor or their agents or employees or any other persons performing portions of the Work under Contract with the Contractor, for any of the following reasons: (1) issuance of an order of a court or other public authority having jurisdiction; (2) an act of government, such as a declaration of national emergency, making material unavailable; (3) because the Design Professional has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification, or because the University has not made payment on a Certificate for Payment within forty-five (45) days of the time stated in the Contract Documents; (4) if repeated suspensions, delays or interruptions by the University constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

If one of the above reasons exists, the Contractor may, upon fourteen (14) additional days' written notice to the University and Design Professional, terminate the Contract and recover from the University payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead and profit.

9.04.2

If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a subcontractor or their agents or employees or any other persons performing portions of the Work under Contract with the Contractor due to University actions or inaction, the Contractor may, upon fourteen additional days' written notice to the University and the Design Professional, terminate the Contract and recover from the University as provided in Subparagraph 9.03.2

10.00 MISCELLANEOUS

10.01

These Contract Documents supersede all previous agreements between the University and the Contractor concerning this Work.

10.02

No action or failure to act by the University shall constitute a waiver of a right afforded it under these General Conditions, nor shall such action or failure to act constitute approval or acquiescence of a breach of these General Conditions, except as may be specifically agreed in writing.

10.03

The invalidity or unenforceability of any provision of these General Conditions shall not affect the validity or enforceability of any other provision.

-End of General Conditions for Construction-

-End of General Conditions for Construction-

SUPPLEMENTARY GENERAL CONDITIONS
OF
CONSTRUCTION

Facilities Planning & Management - Design & Construction Services
Wayne State University

Complete Documents can be downloaded at

http://www.forms.procurement.wayne.edu/RFPs/Supplementary_General_Conditions_General_Contractor_1-3-2017.docx

SUPPLEMENTARY GENERAL CONDITIONS OF CONSTRUCTION (REVISED 7-2018)

Where any article of the General Conditions of the Contract for Construction is supplemented in these Supplementary General Conditions, the original article shall remain in full force and effect and all supplementary provisions shall be considered as added thereto. Where any such article is modified, superseded or deleted here, provisions of such article not so specifically modified, superseded or deleted shall remain in full force and effect.

4.00 RESPONSIBILITIES OF THE PARTIES

Add the following to 4.02.3

.1 Temporary Facilities

.a The Contractor shall be responsible for arranging and providing general services and temporary facilities as specified herein and as required for the Design Professional, the University, all Subcontractors, Separate Contractors and Contractor's staff for the proper and expeditious prosecution of the Work, including, but not limited to, temporary offices and toilets; temporary storage; temporary electrical lighting and power; temporary voice and data communications, temporary water; temporary enclosures; temporary heating and ventilation; temporary openings; material hoists; temporary ladders, ramps and runways; temporary fire protection, protective coverings; temporary fire protection, protective coverings; and construction sign(s). The Contractor shall, at its own expense but included within the Cost of the Work, make all temporary connections to utilities and services in locations acceptable to the University, Design Professional and local authorities having jurisdiction thereof; furnish all necessary labor and materials, and make all installations in a manner subject to the acceptance of such authorities and the Design Professional; maintain such connections; remove the temporary installation and connections when no longer required; and restore the services and sources of supply to proper operating conditions.

.b The Contractor shall make all arrangements with the University and/or the local electrical utility company for temporary electrical service to the Site, shall provide all equipment necessary for temporary power and lighting, and shall pay all charges for this equipment and installation thereof. The electrical service shall be of adequate capacity for all construction tools and equipment without overloading the temporary facilities and shall be made available to all trades. The Contractor shall furnish, install and maintain a temporary lighting system to satisfy minimum requirements of safety and security.

.c Temporary weathertight enclosures and temporary heating shall be provided by the Contractor as required pursuant to the Construction Schedule or Master Project Schedule to complete the Work on or before the Completion Date, to make the building weathertight and suitable working conditions for the construction operations of all trades. Under no circumstances shall the temperature be allowed to reach a level which will cause damage to any portion of the Work which may be subject to damage by low temperatures. Unless otherwise indicated in the Construction Documents, the Contractor shall pay for all fuel, maintenance and attendance required in connection with the portable unit heaters without additional cost or expense to University. Any surface, interior or exterior, damaged by the use of these space heaters shall be replaced by new materials or be refinished to the satisfaction of the Design Professional and University without additional cost to the University.

.d All temporary equipment and conduits for same shall be in accordance with the applicable provisions of the governing codes. All temporary wiring and power conduits shall be maintained in a safe manner and utilized so as not to constitute a hazard to persons or property. All temporary equipment, wiring and conduits shall be completely removed after they are no longer necessary and prior to completion. At the conclusion of use or at the conclusion of the project, any materials or products purchased for the temporary facilities and temporary utilities and paid for, either

directly or indirectly, by the University shall become the property of the University and shall, at the option of the University, be delivered to the University's designated location.

.e Where temporary facilities and associated utilities, and for utilities used in performance of this Agreement can be reasonably provided from existing University services, the University shall bear the cost of such utility consumption. However, for conditions that require the Contractor to use electrical generators or equipment fueled by an independent fuel source, the Contractor shall bear all such costs.

Add the following to 4.02.12

.1 Safety and Protection

.a Contractor shall provide fences, pedestrian walks, barriers, etc. to ensure safety of the general public and Contractor's personnel or as directed by University.

.b Contractor will provide perimeter protection at wall and floor openings, elevator shafts, stairwells, and floor perimeters in accordance with MIOSHA requirements.

.c Combustible rubbish shall be removed daily and shall not be disposed of by burning on site. The entire premises and area adjoining and around the operation shall be kept in a safe and sanitary condition and free of accumulation of trash, rubbish, nuts, bolts, small tools, and other equipment not in use. Contractor is responsible to provide trash containers and fund the removal/disposal of construction debris and general trash.

.d Contractor will regularly ensure that 1) excess material/trash are removed from work sites; 2) passageways (e.g., sidewalks, hallways) are cleared of obstructions; 3) equipment is shut down and secured; and 4) lighted barricades are erected where necessary.

.e All existing means of egress, including stairways, egress doors, panic hardware, aisles, corridors, passageways, and similar means of egress shall, at all times, be maintained in a safe condition and shall be available for immediate use and free of all obstructions.

.f The space under the temporary trailer shall not be used for the storage or placement therein of flammable gases, liquids, or gas and liquid fuel powered equipment. This area shall be kept free of accumulations of any rubbish or trash.

.g In temporary trailers, all exit doors shall be open for egress whenever the unit is occupied. Draw bolts, hooks and other similar locking devices shall be prohibited on all egress doors.

.h On site storage of combustible or flammable liquids shall be limited to one day supply. Indoor storage of propane containers is prohibited.

.i Prior to working in confined spaces on campus, the Contractor must have its written Confined Spaces Program and Permit System reviewed by the University and the documents must meet minimum acceptable standards under the current MIOSHA regulation(s). The Contractor must provide its own atmospheric testing, personal protection, ventilating and rescue equipment as required. The Contractor should seek information from University on any known hazards of the confined spaces to be entered. All manholes and utility tunnels are considered confined spaces.

.j Compressed gas cylinders belonging to Contractor must be properly segregated and secured (with chains or similarly reliable restraining devices) to wall or floor mounted support systems, cylinder storage racks etc., when not in transit. Protective caps must be in place during transit or when not in use.

.k Contractor must follow all of OSHA's lockout/tagout requirements of 29 CFR 1910.147, provide its own lockout/tagout supplies, and be able to demonstrate that its employees have received formal instruction in "lock-tag-try" procedures. Copies of Contractor's written Lockout/Tagout Program shall be made available to the University upon request.

.l Contractor may not use any University sinks, drains or catch basins for the washing of any equipment, tools or supplies, or the disposal of any liquids, (excluding consumable products and hand-soap/water) without the express permission of University. This restriction applies to all sinks (including water fountains) in laboratories, offices and maintenance areas. Additionally, no polluting or hazardous liquids (such as motor oils, cleaners, solvents, paints, diesel fuels, antifreeze, etc.) may be drained onto roads, parking lots, ditches, wetlands, dirt piles or other soil, or into storm or sanitary sewers.

.m Contractor transporting hazardous materials (e.g. reclaimed materials, chemicals, fuels, oils, concrete) to and from campus must follow all applicable Department of Transportation [State or Federal] regulations. This includes proper shipping papers, placarding, material segregation and weight limits.

.n Contractor is also responsible for the proper collection, labeling, transporting, manifesting and disposal of polluting or hazardous wastes such as solvents, paints, oil or antifreeze (and rags contaminated with any of these materials) which are the result of Contractor's activities, as required by State and Federal laws and regulations. Copies of all manifests should remain available for University review upon request. Under no circumstances may hazardous wastes be disposed of in University-owned dumpsters, waste containers, drains or sewers, or drained onto roads, parking lots, ditches, wetlands, dirt piles or other soil.

.o Neither the University nor the Design Professional is responsible for conducting safety inspections or observations, but may make recommendations concerning safety to the Contractor.

.p Fire Protection

(1) All reasonable precautions shall be taken against fire throughout all the Contractor's and Trade Contractors' operations. Flammable material shall be kept at an absolute minimum. Any such materials shall be properly handled and stored.

(2) Construction practices, including cutting, welding and grinding, and protection during construction shall be in accordance with the applicable published standards. During such operations the Contractor shall provide a fire watch person. The University requires a "Hot Work" permit for such activities. The Contractor shall provide a sufficient number of approved portable fire extinguishers, distributed about the Project and in cold weather, non-freeze type portable fire extinguishers shall be used.

(3) Gasoline and other flammable liquids shall be stored in and dispensed from Underwriter's Laboratories listed safety containers in conformance with the National Board of Fire Underwriters recommendations and applicable State laws. Storage, however, shall not be within or immediately adjacent to the building. Storage shall be in a lockable, non-combustible, suitably rated cabinet or structure no less than 25 feet distant from any University building.

(4) The Contractor shall schedule the Work so that the permanent standpipe system shall be installed and made operable at the earliest possible date.

4) All tarpaulins that may be used for any purpose during construction of the Work shall be made of material which is water and weather resistant and fire retardant treated. All tarpaulins shall be Underwriters' Laboratories labeled with flame spread rating of fifteen (15) or less and shall be approved by the University's Representative prior to use.

Add the following to 4.02.13

Hazard Communication: University requires the Contractor to be in full compliance with all applicable Federal and State of Michigan regulations regarding Material Safety Data Sheets ("MSDS"). Upon request, copies of these MSDS must also be provided to the University no less than two weeks prior to the onset of activities. Failure to submit MSDS may result in suspension of Work activities until the MSDS are obtained. If Contractor is to work with hazardous products, it shall notify and update the Project Manager of a) proposed work schedules, b) what to expect in terms of noises/odors, and c) how to access MSDS. The Contractor must also be able to demonstrate that its employees have received "Haz Com" (i.e. Michigan Right-to-Know), and thereby possess a broad understanding of MSDS language. Contractor-owned chemical containers must be labeled with the product name and hazards.

Hazardous Materials: In addition to complying with the Michigan Right-to-Know Law, the Contractor must use and store hazardous materials in accordance with all local, state and federal regulations. Special attention must be paid to the segregation of incompatible materials and the handling/storage of flammable and/or volatile materials. At the end of each work day, hazardous materials must be properly secured, stored in MIOSHA approved containers, and placed in locations authorized by the University or removed from University's property.

Add the following to 4.02.21

.1 Excavation Policy

The policy prescribed herein shall be adhered to for all earth excavation, manual or power, on the University campus that penetrates the surface of the soil by a depth of 6 inches or greater.

.a Non-emergency Situation

- (1) In non-emergency situations (i.e., scheduled maintenance or construction) the Contractor shall contact the University a minimum of seven days in advance of the scheduled excavation.
- (2) The Contractor shall contact Miss Dig, as defined by Public Act 174 of 2013, being MCL 460.721 – MCL 460.733, at least three full business days prior to the scheduled excavation, to ascertain and stake the actual location for all utilities within 50 feet of the limits of the proposed excavation. Actual staking shall be performed not more than three (3) days prior to the excavation.
- (3) Excavation shall commence only with the approval of the University Representative after a complete examination of the site utility drawings and a field observation of the staked site.

.b Emergency Situation

1. In an emergency situation (i.e., loss of services on campus or to a building), the Contractor shall immediately contact the University Representative, examine the site utility drawings to determine the potential interferences, and contact Miss Dig and private stakers, if appropriate, to ascertain and stake the actual location of all utilities within 50 feet of the limits of the proposed excavation. The Contractor shall also immediately contact the local natural gas supplier in addition to Miss Dig, upon a natural gas line failure.
2. Contact the University's Police Department at the emergency number: (313) 577-2222.
3. Excavation shall recommence only with the approval of the University's Representative who will grant approval only after a complete examination of the site utility drawings and a field observation of the staked site and clearance from the utility and University Police Department.

.c Pumping and Draining

The Contractor shall provide and maintain a temporary drainage system and pumping equipment as required to keep all excavation areas within the Site free from water from any source. As the Work progresses, all water shall be removed from basement areas, tunnels, pits, trenches and similar areas as required for proper performance of the Work and to prevent damage to any part of the construction utility. Permanent sump pumps shall not be used for this purpose; however, the Contractor may install temporary pumps in the sump pits until the permanent pumps are installed, providing that it cleans sump pits and drain lines satisfactorily after temporary use. The Contractor shall provide and maintain all pumping and draining equipment as required for the installation of all underground piping and utility conduit systems. Pumping and draining shall be performed in a manner to avoid endangering concrete footings or any adjacent construction or property. Such methods shall be subject to the review of the Design Professional.

.d Post-Excavation

- (1) Provide appropriate pipe protection (wraps, and/or cathodic protection) as originally installed.
- (2) Provide backfill material and compaction in 12-inch lifts to a minimum 95% Maximum Dry Density or higher as required by the Specifications.
- (3) Backfill material shall be as specified; or engineered fill free of all deleterious materials and rubbish of any type. Reuse of excavated material, unless otherwise specifically noted on the drawings, is unacceptable.
- (4) Provide plastic tape trace 24" (12" for shallow trenches) above all utilities indicating utility type by Miss Dig color code and name defined as follows:

<u>Utility</u>	<u>Color</u>	<u>Lettering</u>
Electric	Red	Elect
Oil/Natural Gas	Yellow	Gas
Telephone & Fiber Optic	Orange	Tele
Cable TV	Brown	TV
Water	Blue	Water
Steam	Yellow	Steam
Sewer	Green	Sewer

- (5) Return grade to pre-excavation condition.

Add the following to 4.05.1

The insurance furnished by the Contractor under this Article 4.05.1 shall provide coverage not less than the following:

.1 Workers' Compensation with Employers' Liability & Alternate Employers Endorsement:

(a) Statutory Limits & Employer's Liability \$1,000,000

.2 Commercial General Liability

- (a) \$1,000,000 per occurrence and \$2,000,000 aggregate
- (b) University added as additionally insured on

.3 Contractors' Pollution Liability:

- (a) \$1,000,000 per claim

.4 Professional Liability:

- (a) \$2,000,000 per claim and \$4,000,000 aggregate

.5 Auto Liability with Pollution & Legal Liability

- (a) \$1,000,000
- (b) University added as additionally insured on

.6 Excess Liability (Umbrella):
(a) \$2,000,000

.7 Builder's Risk Insurance in the amount equal to the Contract Sum.

Any deductible or self-insured reserve shall not be refunded to the Contractor from project contingency or other project funds.

Add the following to 4.12

Elevator shafts, electrical closets, pipe and duct shafts, chases, furred spaces and similar spaces which are generally unfinished, shall be cleaned by the Contractor and left free from rubbish, loose plaster, mortar drippings, extraneous construction materials, dirt and dust before preliminary inspection of the Work.

All areas of the Project in which painting and finishing work is to be performed shall be cleaned throughout just prior to the start of this work, and these areas shall be maintained in satisfactory condition for painting and finishing. This cleaning shall include the removal of trash and rubbish from these areas; broom cleaning of floors; the removal of any plaster, mortar, dust and other extraneous materials from all finished surfaces, including but not limited to, all exposed structural steel, miscellaneous metal, woodwork, plaster, masonry, concrete, mechanical and electrical equipment, piping, duct work, conduit, and also all surfaces visible after all permanent fixtures, induction unit covers, convactor covers, covers for finned tube radiation, grilles, registers, and other such fixtures or devices are in place.

In addition to all cleaning specified above and the more specific cleaning which may be required, the Project shall be prepared for occupancy by a thorough final cleaning throughout including washing or cleaning of all surfaces on which dirt or dust has collected. Glass and curtain wall shall be washed and cleaned on both sides by a window cleaning subcontractor specializing in such work. Contractor shall, at University's request, delay such washing of exterior surfaces to such time as requested by University. Recleaning will not be required after the Work has been inspected and accepted unless later operations of the Contractor, in the opinion of the University, make re-cleaning of certain portions necessary.

5.00 INTERPRETATION OF AND ADHERENCE TO CONTRACT REQUIREMENTS

Add the following to 5.04.1

.1 Contractor Requirements

- .a Signature: Each item submitted shall be thoroughly reviewed by the Contractor and have a stamp or note describing the Contractor's action, signed by the person authorized by the Contractor to do the checking with that person's name clearly printed.
- .b Contractor Responsibility: Contractor shall review each submittal for completeness, conformance to the Contract Documents and coordination with other parts of the Work and the Construction Schedule. By providing and submitting to the Design Professional shop drawings, product data, warranties and samples, the Contractor is representing that he or his Subcontractor, has determined and verified (a) the availability of all materials, and (b) field measurements and field construction criteria related thereto, and (c) that he has checked and coordinated the information contained within such submittals with the requirements of the Work, the Contract Documents and

the Construction Schedule and that such shop drawings, samples, warranties and data conform to the Contract Documents.

- .c Limited Acceptance by University and Design Professional: Acceptance is for general design only. Quantities, size, field dimensions and locations are some of the required characteristics which are not part of the acceptance and will not be checked. Accordingly, the limited acceptance shall in no way relieve the Contractor from his obligation to conform his work to required characteristics and to the requirements of the Contract Documents.
- .d Delays: The Design Professional may return incomplete submittals with no action taken. The Contractor shall have no claim for any damages or for an extension of time due to delay in the Work resulting from the rejection of materials or from the rejection, correction, and resubmittal of Shop Drawings, samples and other data, or from the untimely submission thereof.

.2 Approvals

The Design Professional's approval shall not indicate approval of dimensions, quantities or fabrication processes unless specific notations are made by the Design Professional regarding same. The Design Professional will check one of the following notations on the Shop Drawing and Sample Review Stamp:

- .a "REVIEWED-NO EXCEPTIONS NOTED", indicating final action by the Design Professional. When reviewing resubmitted shop drawings the Design Professional assumes that there are no revisions from the previous submittal, except as provided by 5.04.1 and his review of resubmittals is only for the corrections requested with the approval of the balance of the shop drawing being based on the original submission. Where the Contractor directs specific action to revisions, as provided by 5.04.1 the approval includes these also.
- .b "REVIEWED WITH CORRECTIONS NOTED", indicating final action by the Design Professional with the same conditions as "REVIEWED-NO EXCEPTIONS NOTED". Unless he takes exception to the corrections noted, the Contractor may begin that portion of the Work for which the shop drawing was required.
- .c "REVISE AND SEND RECORD COPY", requiring that the Design Professional be sent a copy of the revised shop drawing in accordance with the noted corrections, at the same time it is issued for the Work.
- .d "NOT APPROVED-RESUBMIT", indicating that the Contractor shall not begin that portion of the Work until the reason indicated for disapproval has been corrected and the revised shop drawing submitted, reviewed and approved by the Design Professional.
- .e "NO ACTION REQUIRED", indicating that Contract Documents do not require the Design Professional to review or take any action with this submittal.
- .f Where more than one action has been checked, each shall apply to that portion of the shop drawing for which the action is indicated.

8.00 PAYMENT AND COMPLETION

Add the following to 8.01

8.01.1 Monthly Payment Applications

At a meeting mutually agreed upon between the University's Representative and the Contractor, but no less than monthly, the Contractor shall distribute, in triplicate, draft copies of the proposed Payment Application for review and comment. The review, comment and mutual concurrence will be

an agenda item at that meeting. The Contractor will prepare the formal Application for submission from the comments made on the Draft and will present the formal application as provided for herein, including all required back-up materials, such as waivers of claim, release of claim on bond, sworn statement, documentation for stored materials, certified payroll reports and other documents required by the University Representative.

8.01.2 Offsite Materials

If an Application for Payment is made for materials not installed in the Work, but suitably stored off-site at a location acceptable to the University's Representative, such application shall be accompanied by legally acceptable paid invoices or conditional bills of sale and copies of delivery tickets, signed by the Contractor, indicating the Contractor verified that the materials shown on the delivery tickets are at the location accepted by the University and are adequately insured. Failure of the Contractor to furnish paid invoices, conditional bills of sale and proof of insurance shall be cause for withholding such amounts from payment until such paid invoices or bills of sale have been received by the University. The University reserves the right to examine the stored items prior to payment.

Add the following to subparagraph 8.03

The following submittals shall be bound in three (3) sets, plus one electronic file of all materials:

.1 Project Closeout Documents

- .a The Contractor shall submit to the Design Professional, a written guarantee, which shall be in accordance with Section 8.04 and such additional guarantees, in writing, as are required by the Specifications.
- .b The Contractor shall submit complete instruction for the care and maintenance of all finish materials under the contract, including, but not limited to floor finishes and coverings, wainscot and wall finishes, acoustical treatment, metal finishes, painted surfaces, flooring, hardware, and finishes on mechanical and electrical equipment. Instructions shall contain the manufacturer's or supplier's recommendations with respect to cleaning agents, preservative treatment and such other instructions as may be beneficial to the maintenance, usage, appearance and durability of the product. The recommendations shall further contain cautions on the use of certain cleaners and coatings which may be detrimental to the product.
- .c The Contractor shall prepare and submit operating and maintenance instructions, coordination drawings, and shop drawings for all mechanical and electrical equipment, and other special items, as called for in the specifications.
- .d All of the above described documents shall be checked by Contractor for conformance with the specifications and shall be submitted in uniform size, bound and indexed for cross-reference.
- .e The Contractor shall also submit "As-Built" drawings as specified in Section 4.11.
- .f Copies of all "Attic Stock" transmittals signed by appropriate University personnel accepting the attic stock material.

.2 Project Closeout Training

- a. The University and the Contractor will coordinate, schedule and present formal training for University personnel for all equipment, systems, devices, and building features.
- b. Training shall be scripted to include all important aspects of the equipment and its installation and maintenance. Trainers shall be suitably prepared and experienced in the features of the

equipment and the equipment's installation within the project.

- c. The Contractor, all product vendors, subcontractors, suppliers and materialmen shall consent to and participate in the recording of the training as determined by the University and the Contractor.
- d. The University may supplement training with outside providers to meet the training requirements of the project should a vendor, subcontractor, or supplier fail to provide the required training. The University shall be reimbursed by the Contractor for any such costs for supplemental training.

DRAWINGS

The Technical Specifications dated **February 17, 2025** and the following List of Drawings represent the scope of work as defined in the Contract Documents from Article 4.

DRAWINGS

Drawing No.:	Description
---------------------	--------------------

GENERAL REQUIREMENTS

GENERAL

A. CONTRACTOR'S RESPONSIBILITY

It is not the responsibility of the Architect/Engineer or Owner's Representative to notify the Contractor or subcontractors when to commence, to cease, or to resume work; nor in any way to superintend so as to relieve the Contractor of responsibility or of any consequences of neglect or carelessness by him or his subordinates. All material and labor shall be furnished at times best suited for all Contractors and subcontractors concerned, so that the combined work of all shall be properly and fully completed on the date fixed by the Contract.

The Contractor shall be responsible for all items contained in both the specifications and on the drawings for all trades. He shall be responsible for the proper division of labor according to current labor union agreements regardless of the division of responsibility implied in the contract documents.

B. CODES AND STANDARDS

Reference to standard specifications for workmanship, apparatus, equipment and materials shall conform to the requirements of latest specifications of the organization referenced, i.e., American Society for Testing Materials (ASTM), Underwriters Laboratories, Inc. (UL), American National Standards Institute, Inc. (ANSI), and others so listed in the Technical Specifications.

C. PERMITS, FEES AND NOTICES

See General Conditions, Article 4.02.18

D. MEASUREMENTS

Before proceeding with each Work Item, Contractor shall locate, mark and measure any quantity or each item and report quantities to Engineer. If measured quantities exceed Engineer's estimate, Contractor shall obtain written authorization to proceed from Owner before executing Work required for that Work Item.

Measurement of quantities for individual Work Items will be performed by Contractor and reviewed by Engineer. Coordinate measurements with inspection as required in Section "Coordination."

Cost of Work included in Work Item for quantities as indicated in Contract Documents shall be included in Base Bid.

1. Additions to or deductions from lump sum price for quantities of each Work Item added to or deducted from Work respectively shall be at unit prices indicated in Bid Form and shall constitute payment or deductions in full for all material, equipment, labor, supervision and incidentals necessary to complete Work.

E. CONTRACTOR'S MEASUREMENTS

Before ordering material, preparing Shop Drawings, or doing any work, each Contractor shall verify, at the building, all dimensions which may affect his work. He assumes full responsibility for the accuracy of his figures. No allowance for additional compensation will be considered for minor discrepancies between dimensions on the drawings and actual field dimensions.

F. CONTINUITY OF SERVICE

Continuity of all existing services in the building shall be maintained throughout the construction period. Where it is necessary to tie into the existing electrical service, water or waste systems, it shall be done as directed by the Architect/Engineer. This Contract shall also provide temporary lines or bypasses that may be required to maintain continuous service in the building. All utility shutdowns must be approved by the Owners Representative / Project Manager, not less than **7 business days** prior to the event, so that proper notification can be posted.

G. SUBMITTALS

All submittals (except Shop Drawings) and samples required by the Specifications shall be submitted in triplicate unless otherwise specified for a particular item under an individual Specification Section.

Each sample shall be clearly identified on a tag attached, showing the name of the Project Consultant, the project number and title, the names of the Contractor, manufacturer (and supplier if same is not the manufacturer), the brand name or number identification, pattern, color, or finish designation and the location in the work.

Each submittal shall be covered by a transmittal letter, properly identified with the project title and number and a brief description of the item being submitted.

Contractor shall be responsible for all costs of packing, shipping and incidental expenses connected with delivery of the samples to the Project Consultant or other designated address.

If the initial sample is not approved, prepare and submit additional sets until approval is obtained.

Materials supplied or installed which do not conform to the appearance, quality, profile, texture or other determinant of the approval samples will be rejected, and shall be replaced with satisfactory materials at the Contractor's expense.

H. GENERAL/STANDARD ELECTRONIC EQUIPMENT AND INFRASTRUCTURE REQUIREMENTS

1. Compliance with WSU Standards for Communications Infrastructure

- A. All applicable work, products, materials and methods shall comply with the latest version of the "WSU Standards for Communications Infrastructure" except as where noted.
- B. This document is available at the following website/URL: **<https://computing.wayne.edu/docs/wsu-communications-standards.pdf>**

2. Automation System Program Code

- A. All automation system uncompiled and compiled program codes, source codes, custom modules, graphical user interface screen shots and any other automation system programming data and material (Program Code) shall be provided to the UNIVERSITY in hard copy and on CD Rom in an unencrypted format acceptable to the UNIVERSITY.
- B. Copyright for the Program Code shall be assigned to the UNIVERSITY for the purpose of system maintenance.

PROTECTION OF OCCUPANCY

A. FIRE PRECAUTIONS

Take necessary actions to eliminate possible fire hazards and to prevent damage to construction work, building materials, equipment, temporary field offices, storage sheds, and other property.

During the construction, provide the type and quantity of fire extinguishers and fire hose to meet safety and fire prevention practices by National Fire Protection Association (NFPA) Codes and Standards (available at <http://www.nfpa.org/>)

In the event that construction includes "hot work", the contractor shall provide the Owner's Representative with a copy of their hot work policy, procedures, or permit program. No hot work activity (temporary maintenance, renovation, or construction by operation of a gas or electrically powered equipment which produces flames, sparks or heat that is sufficient to start a fire or ignite combustible materials) shall be performed until such documents are provided. During such operations, all highly combustible or flammable materials shall be removed from the immediate working area, and if removal is impossible, same shall be protected with flame retardant shield.

Not more than one-half day's supply of flammable liquids such as gasoline, spray paint and paint solvent shall be brought into the building at any one time. Flammable liquids having a flash point of 100 degrees F. or below which must be brought into the building shall be confined in an Underwriters Laboratories (UL) labeled safety cans. The bulk supply of flammables shall be stored at least 75 feet from the building and other combustible materials. Spigots on drums containing flammable liquids are prohibited on the project site. Drums shall be equipped with approved vented pumps, and be grounded and bonded.

Only a reasonable working supply of combustible building materials shall be located inside the building.

All oil-soaked rags, papers, and other similar combustible materials shall be removed from the building at the close of each day's work, or more often if necessary, and placed in metal containers, with self-closing lids.

Materials and equipment stored in cardboard cartons, wood crates or other combustible containers shall be stored in an orderly manner and accessibly located, fire-fighting equipment of approved types shall be placed in the immediate vicinity of any materials or equipment stored in this type of crate or carton.

No gasoline, benzene, or like flammable materials shall be poured into sewers, manholes, or traps.

All rubbish shall be removed from the site and legally disposed of. Burning of rubbish, waste materials or trash on the site shall not be permitted.

The contractor shall be responsible for the conduct of employees relative to smoking and all smoking shall be in the area designated by the Architect/Engineer.

B. GENERAL SAFETY AND BUILDING PRECAUTIONS

Provide and maintain in good repair barricades, railings, etc., as required by law for the protection of the Public. All exposed material shall be smoothly dressed.

At dangerous points throughout the work environment provide and maintain colored lights or flags in addition to above guardrails.

Isolate Owner's occupied areas from areas where demolition and alteration work will be done, with temporary, dustproof, weatherproof, and fireproof enclosures as conditions may require and as directed by the Architect/Engineer.

Cover and protect furniture, equipment and fixtures to remain from soiling, dust, dirt, or damage when demolition work is performed in rooms or areas from which such items have not been removed.

Protect openings made in the existing roofs, floors, and other construction with weatherproof coverings, barricades, and temporary fire rated partitions to prevent accidents.

Repair any damage done to existing work caused by the construction and removal of temporary partitions, coverings, and barricades.

The Contractor will be held responsible for all breakage or other damage to glass up to the time the work is completed.

Provide protection for existing buildings, interior and exterior, finishes, walls, drives, landscaping, lawns (see below), etc. All damages shall be restored to match existing conditions to the satisfaction of the Architect/Engineer.

The Contractor and Owner will define the anticipated area of lawn damage at the project Pre-Construction Meeting. Whether the lawn is sparse or fully developed, any lawn damaged due to the Contractor's work will be replaced with sod by the University. The University's unit cost of \$10.00 per square yard and landscaping at a rate of 1.5 times the cost of the sod repairs, the full cost of which will be assessed against the Contractor. At the completion of the project, a deductive Change Order reflecting this cost will be issued.

The Contractor is to include an allowance in his bid for this corrective work.

C. INTERFERENCE WITH OWNER'S OPERATIONS

The Owner will be utilizing the Building Facilities to carry on his normal business operation during construction. The Contractor shall schedule performance of the work necessary to complete the project in such a way as to interfere as little as possible with the operation during construction. The Contractor shall schedule performance of the work necessary to complete the project in such a way as to interfere as little as possible with the operation of the Owner.

Work which will interfere with the Owner's occupancy, including interruptions to the Owner's mechanical and electrical services, and essentially noisy operations (such as jackhammering) shall be scheduled in advance. The schedule of alterations shall be approved by the Architect/Engineer and the work shall be done in accordance with the approved schedule.

It is understood that the work is to be carried through to completion with the utmost speed consistent with good workmanship and to meet the construction schedule.

The Contractor shall begin work under the Contract without delay upon receipt of the fully-executed contract and shall substantially complete the project ready for unobstructed occupancy and use of the Owner for the purposes intended within the completion time stated in the contract.

The Contractor shall, immediately upon award of contract, schedule his work and expedite deliveries of materials and performance of subcontractors to maintain the necessary pace to meet the construction schedule.

CONTRACTOR'S REPRESENTATION AND COORDINATION

A. FIELD SUPERINTENDENT

Contractor shall assign a full time project manager/superintendent for the duration of the project. This person shall be experienced and qualified in all phases of the work and shall be present at the site during Contractor's working hours. The project manager shall have Contractor's full authority to represent Contractor in all routine operations including payment, changes to the work, and scheduling. Contractor shall not re-assign this individual without prior written permission of the Owner.

B. MEETINGS

When directed by the Architect/Engineer, meetings shall be held for the purpose of coordinating and expediting the work. The invited contractors or subcontractors will be required to have qualified representatives at these meetings, empowered to act in their behalf.

C. COORDINATION

The Contractor shall also provide a staff adequate to coordinate and expedite the work properly and shall at all times maintain competent supervision of its own work and that of its subcontractors to insure compliance with contract requirements.

The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work under the Contractor.

D. CONSTRUCTION SCHEDULE

The Construction Schedule shall be prepared after the award of contract. Soon after, a pre-construction meeting is held with the Owner and the Architect/Engineer to determine the areas to which the Contractor will be allowed access at any one time.

The Contractor is alerted to the fact that areas in which he will be working will be occupied by students and employees of the University as well as the general public. The Contractor's access, to and from the project site, will be confined to limited areas so as not to unduly disrupt the normal activities of the University.

TEMPORARY FACILITIES

A. GENERAL

The following temporary facilities descriptions represent standard conditions. Verify accuracy with Architect/Engineer at time of bids.

B. CONTRACTOR'S OFFICE

Provide field offices as required. Locate temporary field offices on site where directed by Architect/Engineer.

Appearance and location of field offices shall be approved by the Architect/Engineer.

Provide for all other administrative facilities and storage off the Owner's property.

C. STORAGE OF MATERIALS

All materials shall be stored in areas designated by the Architect/Engineer. All stored materials shall be arranged for the minimum disruption to occupants and to allow full access to and throughout the building. Materials stored outdoors shall be neat and orderly and covered to prevent damage or vandalism.

D. PARKING

1. GENERAL

University parking regulations will be strictly enforced.

Maintain Owner's parking areas free of dirt and debris resulting from operations under the contract.

2. STANDING AND UNLOADING/LOADING VEHICLES

All Contractors are to call Wayne State University Public Safety at 313-577-2222, and give at least 24 hours advance notice that they have vehicles that must be at the job site.

Vehicles will be permitted at the project site only as long as the vehicles are needed for loading/unloading, and must be immediately moved upon completion.

All unauthorized and/or unattended standing vehicles will be subject to ticketing and removal by University Police. Towed vehicles may be reclaimed by calling 313-577-2222, and paying any assessed charges.

3. COMPLIMENTARY PARKING

There is no complimentary parking for Contractor's employee vehicles.

4. WAYNE STATE UNIVERSITY PUBLIC/STUDENT PARKING AREAS

Public Parking, on a first-come first-served basis is available. Contact the office of the One Card System, at 313-577-9513 for information on availability of parking on a contractual basis.

E. TOILET FACILITIES

The Owner's designated existing toilet facilities may be used by workers on the project. Contractor shall maintain such facilities in a neat and sanitary condition.

F. TELEPHONE USE

No use of the Owner's telephones will be permitted.

G. ACCESS DEVICES

The Contractor shall furnish and maintain temporary hoists, ladders, railings, scaffolds, runways, and the like as required for safe, normal access to the permanent construction until the permanent facilities are complete. Each trade shall furnish such additional means of access as may be required for the progress and completion of the work. Such temporary access devices shall meet all applicable local, state, and federal codes and regulations.

H. HEAT AND VENTILATION

Provide cold weather protection and temporary heat and ventilation as required during construction to protect the work from freezing and frost damage.

Provide adequate ventilation as required to maintain reasonable interior building air conditions and temperatures, to prevent accumulation of excess moisture, and to remove construction fumes.

Tarpaulins and other materials used for temporary enclosures. Coverings and protection shall be flameproofed.

I. WATER SERVICE

Sources of water are available at the site. The Owner will pay for reasonable amounts of water used for construction purposes.

The Contractor shall provide, at the earliest possible date, temporary connections to the water supply sources and maintain adequate distribution for all construction requirements. The Contractor shall protect sources against damage.

Methods of conveying this water shall be approved by the Architect/Engineer and shall not interfere with the Owner's operations.

J. **ELECTRICAL SERVICES**

All charges for reasonable amounts of electrical power energy used for temporary lighting and power required for this work will be paid by the Owner.

The Contractor shall provide and maintain any temporary electrical lighting and power required for this work. At the completion of the work, all such temporary electrical facilities shall be removed and disposed of by the Contractor.

Temporary lighting and power shall comply with the regulations and requirements of the National Electrical Code

INSPECTIONS AND TESTS

The Architect/Engineer shall at all times have access to the work wherever it is in preparation or in progress and the Contractor shall provide proper facilities for such access and for observation.

No failure of the Architect/Engineer, during the progress of the work, to discover or reject materials or work not in accordance with the Contract Specifications and Drawings shall be deemed an acceptance thereof nor a waiver of defects therein. Likewise, no acceptance or waiver shall be inferred or implied due to payments made to contractor or by partial or entire occupancy of the work, or installation of materials that are not strictly in accordance with the Contract Specifications and Drawings.

Where tests are specifically called for in the Specifications, the Owner shall pay all costs of such tests and engineering services unless otherwise stated in the contract.

Where tests are not specifically called for in the Specifications, but are required by the Architect/Engineer or Consultant, the Owner shall pay all costs of such tests and engineering services unless the tests reveal that the workmanship or materials used by the Contractor are not in conformity with the Drawings, Specifications, and/or approved shop drawings. In such event, the Contractor shall pay for the tests, shall remove all work and materials so failing to conform and replace with work and materials that are in full conformity.

CLEAN-UP

The Contractor shall at all times keep the Owner's premises and the adjoining premises, driveways and streets clean of rubbish caused by the Contractor's operations and at the completion of the work shall remove all the rubbish, all of his tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the work clean and ready for use. If the contractor does not attend to such cleaning immediately upon request, the Architect/Engineer may cause such cleaning to be done by others and charge the cost of same to the Contractor.

The Contractor will be responsible for all damage from fire that originates in, or is propagated by, accumulations of rubbish or debris.

All rubbish and debris shall be disposed of off the Owner's property in an approved sanitary landfill site. No open burning of debris or rubbish will be permitted. Job site shall be left neat and clean at the completion of each day's operation.

PROJECT CLOSE-OUT

A. **RECORD DRAWINGS**

At beginning of job, provide one copy of Working Drawings, and record changes, between Working Drawings and "As Built", including changes made by Addenda, Change Orders, Shop Drawings, etc. These shall be kept up to date. Update to indicate make of all mechanical and electrical equipment and fixtures installed. Keep these Record Prints in good condition and available for inspection by the Architect/Engineer.

Upon completion of the job, turn over to the Architect/Engineer Record Prints of Working Drawings showing all job changes.

B. OPERATING AND MAINTENANCE DATA

Prepare and furnish to the Architect/Engineer three (3) bound copies of "Operating and Maintenance Manual" on all equipment installed under this Contract.

Manual shall include copies of all Manufacturers' "Operating and Service Instructions", including Parts List, Control Diagrams, Description of Control Systems, Operating, Electrical Wiring, and any other information needed to understand, operate and maintain the equipment. The names and addresses of all subcontractors shall be included. These instructions shall be custom-prepared for this job -- catalog cuts will **not** be accepted. Equipment shall be cross-referenced to Section of Specifications and to location shown and scheduled on drawings.

Include Test-Adjust-Balance Report in the Manual.

C. FINAL INSPECTION

Secure final inspections from the State of Michigan as soon as the work is completed and immediately submit such Certificates to the Architect/Engineer.

D. GUARANTEES (See Sections 00510 and 01781)

Guarantees on material and labor from the General Contractor and his subcontractors shall be as required in Sections 00510 and 01781.

E. SWORN STATEMENT AND WAIVER OF LIENS

Prior to final payment, the General Contractor shall provide a Contractor's Sworn Statement and Full Unconditional Waivers of Liens from all subcontractors for material and labor and from all suppliers who provide materials exceeding \$10,000. Sworn Statements and signed waivers from all Subcontractors must accompany Pay Applications or they will be returned for such documentation prior to approval.

ASBESTOS HAZARD

The contractor shall not start any work in any area that has not been inspected for asbestos by the Owner's Industrial Hygiene Department, or a qualified representative of the Owner and approval is given for work to be done. If asbestos is found, safety measures as recommended by the Owner's Industrial Hygiene Department, or a qualified representative of the Owner, shall be completed, or approval given for work to be done before work is started. The contractor shall not perform any asbestos removal or containment work under the contract.

KEYS

The Owner shall provide the contractor keys on loan to have access to the various spaces in order to complete the contract. Contractor will sign for and be responsible for each key on loan, returnable to Owner upon completion of the contract. In case of any lost keys, the Owner will back-charge the contract \$250.00 for each core change. In the event that a Contractor wants access to a secured area, he shall give the Owner a minimum 48-hour notice.

SUMMARY OF WORK

SUMMARY OF WORK

PROJECT: C.S. Mott Lab Renovations

WSU PROJECT NO.: 609-408429

PROJECT MANAGER: Mark Gibbons

1. EXAMINATION

The Contractor shall visit the site and become familiar with conditions under which he will be working. Also meet with the project manager and review site access, storage areas, etc.

2. Description of Work – Project includes **This project will renovate three research laboratories in the C.S Mott building and includes plumbing, electrical, mechanical and casework etc..**

3. The building is located at

Wayne State University
275 East Hancock Avenue
Detroit, Michigan 48202

PROJECT MANUAL
FOR

KEI TO Mott Center LAB RENOVATION

WAYNE STATE UNIVERSITY

DETROIT, MICHIGAN

WSU PROJECT NO. 609-408429

Design & Construction Services
Facilities Planning & Management
Wayne State University
5454 Cass Avenue
Detroit, MI 48202

iDesign Solutions, LLC
Architects Scientists and Planners
2531 Ridge Road, Suite 100
White Lake, Michigan 48383
iD Project No. 1184-2

December 20, 2024
100% CD/BID ISSUE

SECTION 00 01 07

SEALS PAGE

PART 1 GENERAL

ARCHITECTURAL

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Architect under the laws of the State of Michigan.

Laura A. Clary, AIA, ALA, NCARB, LEED-AP 

Date: 12-20-2024 Registration No.: 1301049628

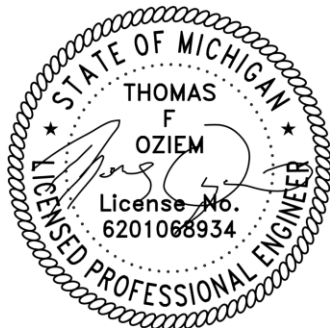


MECHANICAL

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Mechanical Engineer under the laws of the State of Michigan.

Thomas Oziem, PE, CEM 

Date: 12-20-2024 Registration No.: 6201068934



ELECTRICAL

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Electrical Engineer under the laws of the State of Michigan.

Matt Williams, PE *Matthew Williams* _____

Date: 12-20-2024 Registration No.: 6201311034



PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION - Not Applicable To This Section

END OF SECTION

TABLE OF CONTENTS

INTRODUCTORY INFORMATION

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00 01 15	List of Drawing Sheets

PROCUREMENT DOCUMENTS *(PROVIDED BY WAYNE STATE UNIVERSITY)*

DIVISION 00 00 00 - BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT

00 05 00	Information for Bidders
00 10 00	Instructions to Bidders
00 25 00	Notice of Pre-Bid Conference
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SECTION 01 40 00

QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Quality Monitoring: Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality. Perform quality control procedures and inspections during installation.
- B. Standards: Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Tolerances: Monitor fabrication and installation tolerance control of products to produce acceptable high quality Work. Do not permit tolerances to accumulate. Comply with manufacturers' tolerances and installation requirements.
- D. Reference Standards:
 - 1. Wayne State University, Construction Design Standards, Second Revision, November 2018.
 - 3. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- E. Manufacturer's Field Services: When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to perform the following as applicable, and to initiate instructions when necessary.
 - 1. Observe site conditions.
 - 2. Conditions of surfaces, surface preparation and installation.
 - 3. Quality of workmanship.
 - 4. Start-up of equipment.
 - 5. Test, adjust and balance of equipment.

PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION - Not Applicable To This Section

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. Security and Protection: Coordinate with the Owner to provide security and protection requirements including the following:
 - 1. Fire extinguishers.
 - 2. Site enclosure, barricades, warning signs, and lights.
 - 3. Environmental protection and dust control.

PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION - Not Applicable To This Section

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Manufactures: Provide products from one manufacturer for each type or kind as applicable. Provide secondary materials as required by manufacturers of primary materials.
- B. Product Selection: Provide products selected by Architect.
- C. Substitutions: Request for substitution must be in writing and requires approval by Owner and Architect. Products submitted for substitution shall be submitted with complete documentation, and include construction costs of substitution including related work. Conditions for substitution include:
 - 1. Specified material cannot be coordinated with other work.
 - 2. Specified material is not acceptable to authorities having jurisdiction.
 - 3. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.
- D. Substitution Requests: Substitutions shall be submitted prior to award of contract, unless otherwise acceptable as per Wayne State University general and supplemental conditions. Approval of shop drawings, product data, or samples containing substitutions is not an approval of a substitution unless an item is clearly presented as a substitution at the time of submittal.

PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION - Not Applicable To This Section

END OF SECTION

SECTION 01 63 10
SUBSTITUTION REQUEST FORM

PART 1 GENERAL

1.1 IDENTIFICATION

- A. Request Number: _____
- B. Contractor: _____
- C. Subcontractor: _____

1.2 REQUEST

A. We hereby submit for consideration the following product in place of the specified product for this project:

- 1. Specified Product Specification Section / Reference Drawing(s):

- 2. Proposed Substitution:

- 3. Manufacturer:

- 4. Location:

- 5. Product Website URL:

- 6. Phone:

- 7. Time Used:

- 8. Identify the Difference between Proposed Substitution and Specified Product: (All substitutions and exceptions must be listed, omission of this information and acceptance of materials otherwise submitted will not relieve the obligation for the contractor to meet design as drawn and specified.)

1.3 INFORMATION

A. Attach complete information for changes to Drawings and/or Specifications which the proposed substitution will require for its proper installation.

1.4 SUBMISSION

A. Submit with request all necessary samples and substantiating data to establish equivalent quality and performance to the specified product. Clearly mark manufacturer's literature to indicate equivalent performance.

1.5 AFFIRMATION

A. Does the substitution affect dimensions shown on the drawings? ___Yes ___No
If yes, clearly indicate how:

B. Does the substitution request result in a (credit___) (add___) (no charge___) to the base contract amount?

1. If Credit/Add, How Much: (-/+)

C. Will the Undersigned pay for all additional costs resulting from the proposed substitution including the Architect's and Consultant's additional services? ___Yes ___No

If no, fully explain:

D. What effect does the substitution have on the other subcontracts or trades?

E. What effect does the substitution request have on the construction schedule?

F. Are manufacturer's warranties for the proposed and specified product the same? ___Yes ___No
If no, explain or provide attachment_____

G. Reason for substitution request:_____

H. Itemized comparison of specified product(s) and proposed substitution:

I. Accurate cost data comparing proposed substitution with specified product:

J. Differences of maintenance services and sources:

1.6 AFFIRMATION DOCUMENTATION

- A. Submit executed affidavit from Product Manufacturer.
- B. Additionally, submit Testing Laboratory Certificate.
- C. Contractor is specifically bound by the General Conditions in addition to those of this Section.

1.7 ARCHITECT'S ACTION

A. Refer to Applied Review Stamp with Annotations for Approved, Approved as Noted (conditional approval), Not approved, Revise and Resubmit.

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Substantial Completion: The following are prerequisites to substantial completion. Provide the following.
 - 1. Punch list prepared by Contractor and subcontractors as applicable.
 - 2. Supporting documentation.
 - 3. Warranties.
 - 4. Certifications.
 - 5. Occupancy permit.
 - 6. Start-up and testing of building systems.
 - 7. Change over of locks.
 - 8. Commissioning documentation.
- B. Final Acceptance: Provide the following prerequisites to final acceptance.
 - 1. Final payment request with supporting affidavits.
 - 2. Completed punch list.
- C. As-Built Drawings: Provide a marked-up set of drawings including changes, which occurred during construction.
- D. Project Closeout: Provide the following during project closeout.
 - 1. Submission of record documents.
 - 2. Submission of maintenance manuals.
 - 3. Training and turnover to Owner's personnel.
 - 4. Final cleaning and touch-up.
 - 5. Removal of temporary facilities.

PART 2 PRODUCTS - Not Applicable To This Section

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

- A. Cutting and Patching: Provide cutting and patching work to properly complete the work of the project, complying with project requirements for:
 - 1. Mechanical/electrical systems.
 - 2. Visual requirements, including detailing and tolerances.
 - 3. Operational and safety limitations.
 - 4. Fire resistance ratings.
 - 5. Inspection, preparation, and performance.
 - 6. Cleaning.
- B. Means and Methods: Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decrease energy performance,

increase maintenance, decrease operational life, or decrease safety performance.

- C. Inspection: Inspect conditions prior to work to identify scope and type of work required. Protect adjacent work. Notify Owner of work requiring interruption to building services or Owner's operations.
- D. Performance of Operations: Perform work with workmen skilled in the trades involved. Prepare sample area of each type of work for approval.
- E. Cutting: Use cutting tools, not chopping tools. Make neat holes. Minimize damage to adjacent work. Inspect for concealed utilities and structure before cutting.
- F. Patching: Make patches, seams, and joints durable and inconspicuous. Comply with tolerances for new work.
- G. Cleaning: Clean work area and areas affected by cutting and patching operations.

END OF SECTION

SECTION 02 41 19.16

SELECTIVE INTERIOR DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Provide demolition activities. Demolition shall not impact the building structure, building enclosure, building core functions or building egress. Demolition shall be limited to select interior elements, utilities and finishes.

1.2 SUBMITTALS

- A. Schedule: Submit for approval selective interior demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.

1.3 QUALITY ASSURANCE

- A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers.

1.4 PROJECT CONDITIONS

- A. Occupancy: Immediate areas of work will not be occupied during selective interior demolition. Personnel and students may occupy adjacent areas. Adjacent areas to remain operational during demolition.
- B. Existing Conditions: No responsibility for buildings and structures to be demolished will be assumed by the Owner.

PART 2 PRODUCTS

2.1 DEMOLITION APPLICATIONS

- A. Demolition:
 1. Application: Salvage of designated items identified in drawings and by WSU project manager.
 2. Application: Protection of existing structure and adjacent assemblies, finishes and materials. Include walk off mats at entrances to work areas to minimize dirt in building areas not in project scope.
 3. Application: Disconnection, capping, and removal of utilities.
 4. Application: Pollution control during building demolition, including noise control.
 5. Application: Removal and legal disposal of materials.
 6. Salvage: Designated items.

7. Utilities: Interruption, capping or removal as applicable.
8. Hazardous Materials: Not known to be present.

PART 3 EXECUTION

3.1 SELECTIVE DEMOLITION

- A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Items of salvage value, not included on schedule of salvage items to be returned to Owner, shall be removed to a storage facility as identified by the Owner. Storage or sale of items at project site is prohibited.
- B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.
- C. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.
- D. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.
- E. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.
- F. Restoration: Restore finishes of patched areas to match existing material and finish.

END OF SECTION

SECTION 03 54 00

CEMENTITIOUS UNDERLAYMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Provide cementitious underlayment.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cementitious Self-Leveling Underlayment:
 1. Basis of Design Manufacturer: Allied Custom Gypsum; LATICRETE SUPERCAP, LLC; Maxxon Corp.; Ardex
 2. Type: Low-alkali, cement-based, self-leveling underlayment.
 3. Compressive Strength: 4200 psi or higher.
 4. Pour Depth: Average 1/4 inch to 1-1/2 inches.
 5. Primer: As recommended by manufacturer based on project conditions.
 6. Moisture Vapor Control coating: As recommended by manufacturer based on project conditions.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions and approved submittals. Install materials in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION

SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Sound attenuation insulation.
- B. Related Sections include the following:
 - 1. Division 9, Section "Gypsum Board Assemblies".
 - 2. Division 9, Section "Non-structural Metal Framing".
 - 3. Division 9, Section "Acoustical Ceilings".
 - 4. Division 9, Section "Resilient Base and Accessories".

1.2 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
 - 1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.
 - 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
- C. Product test reports.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

- A. Retain ASTM test method below based on product and kind of fire-resistance characteristic specified for each product in Part 2. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
- 2. Products: Subject to compliance with requirements, provide one of the products specified.
- 3. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers:
 - 1. CertainTeed Corporation.
 - 2. Johns-Manville Corp.
 - 3. Owens-Corning Fiberglas Corp.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- C. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form:
 - 1. 3-inch- (76-mm-) thick, unfaced glass-fiber blanket insulation.
 - 2. 1-1/2-inch- (38-mm-) thick, unfaced glass-fiber blanket.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated. Provide all materials for a complete installation including manufacturer's recommended fasteners for specified application.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Install 3-inch- (76-mm-) thick, unfaced glass-fiber blanket insulation over suspended ceilings at partitions in a width that extends insulation 24 inches (610 mm) on either side of partition.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide firestopping of all penetrations through fire rated wall construction as well as floor penetrations both above and below the area to be renovated. This includes all new work as well as filling in any missing firestopping at existing penetrations to remain.
- B. Related Sections include the following:
 - 1. Division 9: Section "Gypsum Board Assemblies"
 - 2. Division 22: Plumbing
 - 3. Division 23: Heating, Ventilating and Air Conditioning
 - 4. Division 24: Electrical

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Submit for approval test reports and product certificates.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Fire Performance: UL 2079, ASTM E 814, and local regulations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Firestopping Systems:
 - 1. Manufacturers: 3M Fire Protection Products; A/D Fire Protection Systems Inc., e.z. barrier; Henkel Corporation; Specified Technologies Inc.
 - 2. Applications as Applicable to Assembly: Through-penetrations, fire-resistive joints, perimeter fire containment, smoke seals.
 - 3. Types as Applicable to Assembly: Endothermic and intumescent

- sealants, pillows, putty and wrap strips.
4. Provide firestop systems and accessories that are compatible with one another.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Review extent of work with authorities having jurisdiction and obtain approval of installation thicknesses and methods.
- B. Sequence work to avoid need for removal of firestopping by work of other trades.
- C. Comply with manufacturers' instructions and recommendations. Securely anchor insulation with safing clips. Install firestopping without gaps or voids.
- D. Protect, inspect and repair work until final acceptance.

END OF SECTION

SECTION 07 92 00

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

- A. Provide joint sealers and fillers.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
 - 1. Include manufacturers full range of color and finish options if additional selection is required.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Interior Joints, Limited Movement, Acrylic:
 - 1. Manufacturers: 3M, Dupont, Dow Corning, Lexon and GE.
 - 2. Materials: Acrylic-emulsion, ASTM C 834.
- B. Interior Joints, Moisture and Mildew Resistant Silicone:
 - 1. Manufacturers: 3M, Dupont, Dow Corning, Lexon and GE.
 - 2. Materials: One-part mildew-resistant silicone sealant, ASTM C 920.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Examine substrate; report unsatisfactory conditions in writing. Beginning work means acceptance of substrates.
- B. Provide sealants in colors as selected from manufacturer's standards.

- C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections. Clean and prime joints, and install bond breakers, backer rods and sealant as recommended by manufacturers.
- D. Depth shall equal width up to 1/2 inch wide; depth shall equal 1/2 width for joints over 1/2 inch wide.
- E. Cure and protect sealants as directed by manufacturers. Replace or restore damaged sealants. Clean adjacent surfaces to remove spillage.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Provide steel doors and frames.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Standards: ANSI/SDI-100, Recommended Specifications for Standard Steel Doors and Frames.
- C. Performance Standards:
 - 1. Fire-Rated Assemblies: NFPA 80, and acceptable testing agency listing.
 - 2. Thermal-Rated Assemblies at Exterior: ASTM C 236 or ASTM C 976.
 - 3. Sound-Rated Assemblies at Mechanical Rooms: ASTM E 1408, and ASTM E 413.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Interior Steel Doors:
 - 1. Material: Minimum 18 gauge steel sheet.
 - 2. Thickness: 1-3/4 inches.
 - 3. Finish: Factory primed and field painted.
 - 4. Finish: Factory finished.
 - 5. Accessories:
 - a. Sightproof stationary louvers.
 - b. Glazing stops.
 - c. Silencers.
- B. Interior Steel Frames:

1. Material: Minimum 16 gauge steel sheet.
2. Corners: Mitered or coped.
3. Type: Knockdown.
4. Finish: Factory primed and field painted.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Fabricate work to be rigid, neat and free from seams, defects, dents, warp, buckle, and exposed fasteners. Install doors and frames in compliance with SDI-100, NFPA 80, and requirements of authorities having jurisdiction.
- B. Provide thermally improved doors with maximum U-value of 0.24 BTU/hr./sq. ft. degree F (ASTM C 236) for all exterior doors and elsewhere as noted.
- C. Provide acoustically improved doors with minimum STC of 33 (ASTM E 90 and ASTM E 413) where indicated.
- D. Hardware: Prepare doors and frames to receive hardware on final schedule. Provide for 3 silencers on single doorframes; 2 on double doorframes.
- E. Shop Finish: Clean, treat and prime paint all work with rust-inhibiting primer comparable with finish paint specified in Division 9 section. Provide asphalt emulsion sound deadening coating on concealed frame interiors.
- F. Touch-up damaged coatings ready to receive finish painting.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer with a factory finish.

B. Related Requirements:

1. Division 8, Section "Hollow Metal Door and Door Frames".
2. Division 8, Section "Glazing".

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Sustainable Design Submittals:

1. Chain-of-Custody Qualification Data: For manufacturer and vendor.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

D. Samples: For plastic-laminate door faces and factory-finished doors (must include actual flitches and finishes provided by panel manufacturer).

1.3 INFORMATIONAL SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Graham Wood Doors; ASSA ABLOY Group company; <product name or designation> or a comparable product by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Buell Door Co.
 - 3. Ideal Wood Products.
 - 4. Weyerhaeuser Co.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards and WDMA I.S.1-A, "Architectural Wood Flush Doors."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
- B. Certified Wood: Wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.
- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic

Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

- E. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
 - 2. Extra Heavy Duty: Janitor's closets, exits and where indicated in Architect's Door Schedule.
 - 3. Standard Duty: Private toilets and where indicated.

- F. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

- G. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

- H. Particleboard-Core Doors for Standard Wood Doors:
 - 1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
 - 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - 3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

- I. Mineral-Core Doors for Rated Wood Doors:
 - 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 - 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 - 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Species: as per Architect's finish schedule.
3. Finish: As per Architect's finish schedule.
1. Cut: rift cut.
2. Match between Veneer Leaves: book matching on faces of door panels. Finish exposed edges of the door with the same species as the door faces with matching grain and cut.
3. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
4. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
5. Doors with lites provide wood stops on each side of lite. Removable stops will be used on the secured side of the door.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 8, Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors that are indicated to receive transparent finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 11, catalyzed polyurethane.
3. Staining: Match Architect's sample.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 1. Install fire-rated doors according to NFPA 80.
 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 1. Clearances: Provide 3.0 mm at heads, jambs, and between pairs of doors. Provide 3.0 mm from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 6.0 mm from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Provide door hardware.
- B. Related Sections include the following:
 - 1. Division 8, Section "Hollow Metal Door and Door Frames".

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Submit for approval hardware schedule proposed for use based on Owner's requirements.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Hardware for Fire-Rated Openings: NFPA 80, and local requirements.
- C. Materials and Application: ANSI A156 series standards.
- D. Hardware shall comply with ADA requirements for handle and pull force.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Door Hardware: Provide door hardware as per building standard.
 - 1. Manufacturers:
 - a. Hinges: Hager Hinge, McKinney/Parker and Stanley Hardware.
 - b. Cylinder Locksets and Latchsets: Corbin/Ruswin (2000 Series), Best 7-K.
 - c. Closers: Corbin Ruswin Architectural Hardware, LCN and Norton Door Control.

- d. Cylinder Locks and Deadbolts: Best (7A/9A Series) and Corbin/Ruswin Architectural Hardware.
 - e. Manual Flush Bolts: Glynn-Johnson.
 - f. Offline Electronic Lock: Schlage AD-250.
 - g. Accessories (Stops, coordinators, kick plates, etc.): Baldwin Hardware, Glynn-Johnson, Hager, Hiawatha, Ives, Rockwood Architectural.
2. Quality Level: Commercial.
 3. Locksets and Latchsets: Mortise type.
 4. Lock Cylinders: Interchangeable.
 5. Keying: Owner's requirements 7-pin (SFIC) small format interchangeable core.
 6. Hinges and Butts: Provide 3 steel hinges, full-mortise type at interior.
 7. Closer: Provide hydraulic door closer with hold open.
 8. Hardware Finishes: Satin stainless finish on exposed surfaces.
 9. Auxiliary Materials:
 - a. Stops and overhead door holders.
 - b. Soundstripping.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Follow guidelines of DHI 'Recommended Locations for Builder's Hardware and hardware manufacturers' instructions.
- B. Contractor to provide construction cores at all lockable locations prior to substantial completion. Wayne State University shall provide a core combination schedule and key quantity requirement to the contractor. The contractor shall provide and install permanent cores at the time of substantial completion.
- C. Adjust operation, clean and protect.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide glass and glazing.
- B. Related Sections include the following:
 - 1. Division 8, Section "Hollow Metal Door and Door Frames".
 - 2. Division 8, Section "Flush Wood Doors".

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- D. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.
 - 1. Laminated Glass: Manufacturer's 5-year warranty.
 - 2. Tempered Glass: Manufacturer's 10-year warranty.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Glazing for Fire-Rated Assemblies: Glazing for assemblies that comply with NFPA 80.
- C. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
- D. Glazing Publications:
 - 1. GANA Publications: GANA's 'Glazing Manual.' and 'Laminated Glass Design Guide.'
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, 'Glazing Guidelines for Sealed Insulating Glass Units.'

E. Glass standards:

1. ASTM specification C1048 for glass.
2. ASTM specification C1036 for glass.

F. Safety Glazing: Materials complying with testing requirements of Consumer Products Safety Commission 16 CFR 1201 Category II, and American National Standards Institute ANSI Z97.1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council.

PART 2 PRODUCTS

2.1 MATERIALS

A. Glass and Glazing:

1. Manufacturers:
 - a. Afg Industries Inc.
 - b. Ford Glass.
 - c. Guardian Industries Corp.
 - d. Pilkington LOF.
 - e. PPG Industries. Corp.
2. Type: Single glass units, tempered.
3. Type: Laminated glass units.
4. Auxiliary Materials:
 - a. Compression gaskets.
 - b. Elastomeric glazing sealants.
 - c. Preformed glazing tapes.
 - d. Glazing gaskets.
 - e. Setting blocks, spacers, and compressible filler rods.
 - f. Mirror adhesive, top and bottom angles and clips.

B. Fire-Rated Glazing:

1. Manufacturers: Vetrotech - Fire-Rated Glass & Systems.
2. Type: Fire-rated glazing as vision lights in fire-rated door assemblies.
3. Material: Transparent ceramic.
4. Fire Rating: As required for application.

PART 3 EXECUTION

3.1 GLAZING

A. General: Comply with written instructions of manufacturers of glass, sealant, gasket, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

1. Glazing channel dimensions, as indicated on drawings, shall provide necessary bite on glass, minimum edge and face clearance, and adequate

sealant thicknesses, with reasonable tolerances.

2. Protect glass edges from damage during handling and installation. Remove damaged glass from project site and legally dispose of off project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance.

B. Follow industry best practices, published guidelines of the Glass Association of North America, and applicable manufacturer's recommendations for proper tape, gasket, sealant, and lock-strip glazing.

3.2 INSTALLATION

- A. Inspect framing and report unsatisfactory conditions in writing.
- B. Comply with GANA "Glazing Manual" and manufacturer's instructions and recommendations. Use manufacturer's recommended spacers, blocks, primers, sealers, gaskets and accessories.
- C. Install glass with uniformity of pattern, draw, bow and roller marks.
- D. Install sealants to provide complete wetting and bond and to create a substantial wash away from glass.
- E. Set mirrors on stainless steel clips and adhere to wall with mirror adhesive.
- F. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come in contact with glass, remove them immediately as recommended by the glass manufacturer.
- G. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- H. Wash glass on both exposed surfaces in each area of project not more than four days before date scheduled for inspections that establish date of substantial completion. Wash glass as recommended by glass manufacturer.

END OF GLAZING

SECTION 08 87 00

WINDOW FILM - PRIVACY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Architectural Window Film:
 - 1. Frost/Matte film (Fasara). (Opaque Black) and (Milky White (Milano)

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
 - 2. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
 - 3. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
 - 4. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
 - 5. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
- B. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.
- C. GSA-TS01 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.
- D. NFRC 100/200 (Formerly ASTM E903) - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
- E. IES LM-83-12: IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure.
- F. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.
- G. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.
- H. Window 6.3 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

1.3 DEFINITIONS

- A. Light to Solar Gain Ratio: The ratio of visible light transmission to Solar Heat Gain Coefficient.

1.4 PERFORMANCE REQUIREMENTS

- A. Safety Glazing Impact Performance:

1. 150 ft-lbs impact resistance, meeting ANSI Z97.1 (Class B, Unlimited) and 16 CFR 1201 (Category 1) impact requirements with film applied on 1/8 inch annealed glass.
- B. Tear Resistance:
 1. Minimum Graves Area Tear Strength of 1,050 lbs percent as measured on coated film product, without liner, per ASTM D1004.
- C. Adhesion to Glass:
 1. Minimum 6 lbs/in peel strength per ASTM D3330 (Method A).
- D. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
 1. Flame Spread Index: no greater than 25.
 2. Smoke Developed Index: no greater than 55.
- E. Abrasion Resistance:
 1. Film shall have a surface coating that is resistant to abrasion such that less than 5 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
- F. UV Light Rejection:
 1. Minimum of 99 percent UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's current technical literature on each product to be used, including:
 1. Manufacturer's Data Sheets.
 2. Preparation instructions and recommendations.
 3. Storage and handling requirements and recommendations.
 4. Installation methods.
- B. Verification Samples: For each film specified, two samples representing actual film color and pattern.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
 1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
 2. Provide a Glass Stress Analysis of the existing glass and proposed glass/film

combination as recommended by the film manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Follow Manufacturer's instructions for storage and handling.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
- B. In order to validate warranty, installation must be performed by an Authorized 3M dealer and according to Manufacturer's installation instructions. Verification of Authorized 3M dealer can be confirmed by submission of active 3M dealer code number.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Design standard based upon: 3M Commercial Solutions, which is located at: 3M Center Bldg. 220-12-E-04; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651 737 8241
- B. Llumiar
- C. Americal Glass Coating
- D. Burden of proof for equality of the film lies solely on the manufacturer.

2.2 ARCHITECTURAL FINISH FILMS

- A. Architectural Finish Films: 3M FASARA Glass Finishes Film as manufactured by 3M Company - Commercial Solutions.
- B. Material Properties:
 - 1. General: Glass and plastic finishes field-applied application to glass or plastic material as visual opaque film.
 - 2. Film: Polyester.
 - 3. Decorative Pattern: Printed.
 - 4. Adhesive: Acrylic, Pressure Sensitive, Permanent.
 - 5. Liner: Silicone-coated Polyester.

6. Thickness (Average): 3.2 mils (80 microns).
 7. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84: Class A:
 - a. Flame Spread: 25 maximum.
- C. Optical Performance: Frost/Matte and Mirror Series.
1. FASARA - Opaque Black Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
 - a. Ultraviolet Transmittance: 0.1 percent.
 - b. Visible Light Transmittance: 0.4 percent.
 - c. Visible Light Reflectance - Interior: 5 percent.
 - d. Solar Heat Transmittance: 1 percent.
 - e. Solar Heat Reflectance: 5 percent.
 - f. Shading Coefficient at 90 Degrees (Normal Incidence): 0.39.
 2. FASARA - Milky White (Milano) Decorative / Privacy Glazing Film applied to 3 mm thick clear glass (ASTM E 903, ASTM E 308):
 - a. Ultraviolet Transmittance: 0.1 percent.
 - b. Visible Light Transmittance: 59 percent.
 - c. Visible Light Reflectance - Interior: 21 percent.
 - d. Solar Heat Transmittance: 57 percent.
 - e. Solar Heat Reflectance: 17 percent.
 - f. Shading Coefficient at 90 Degrees (Normal Incidence): 0.75.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Film Examination:
1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
 - a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
 2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
 3. Commencement of installation constitutes acceptance of conditions.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

A. Film Installation, General:

1. Install in accordance with manufacturer's instructions.
2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
4. Apply film to glass and lightly spray film with slip solution.
5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

B. Impact Protection Attachment Sealant Installation:

1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator. Refer to 3M publication, 70-0709-0322-7, 3M Impact Protection Adhesive Attachment System Installation Instructions.
 - a. For blast mitigation: minimum 1/2 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
 - b. For windborne debris protection: minimum 3/8 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
2. To ensure a straight and consistent bead width is achieved, masking tape may be applied to film and frame surfaces prior to application.
3. With prior approval of the building owner or property manager, existing compression gaskets may be partially removed or trimmed to allow for a thinner bead and stronger anchorage. If removing the gaskets, sections shall be trimmed approximately 3 inches in length and inserted with appropriate spacing along all sides of the window to help secure the glazing during application and curing of the Impact Protection Adhesive.
4. The Impact Protection Adhesive shall be dispensed with a caulk gun with nozzle opening diameter sized to match the approximate size of the desired bead width.
5. A plastic putty knife or other tool with a clean straight edge shall be used to trowel and smooth out the adhesive. The completed adhesive bead shall be relatively triangular in shape.
6. Any masking tape used shall be carefully removed within 10 minutes after applying the wet glaze.

3.4 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Provide gypsum board assemblies.

1.2 RELATED SECTIONS

- A. Division 09, Section "Non-structural Metal Framing".
- B. Division 09, Section "Resilient Base and Accessories".
- C. Division 09, Section "Paints".

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.4 QUALITY ASSURANCE

- A. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Tolerances: Not more than 1/16-inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall be not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.
- C. Performance: Fire, moisture resistant, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Gypsum Board:
 - 1. Manufacturers:
 - a. CertainTeed Gypsum, Inc.
 - b. Lafarge North America Inc.
 - c. Clark Dietrich Building Systems
 - 2. Application: Interior walls, partitions and partial height wall with tape and joint compound finish.
 - 3. Material Standard: ASTM C1396.

4. Type: Board for tape and joint compound finish.
 - a. Type: Regular and fire-rated types as required.
 - b. Typical Thickness: 5/8 inch.
5. Joint Treatment: ASTM C474 and ASTM C840, 3-coat system, paper or fiberglass tape.
6. Auxiliary Materials:
 - a. Cornerbead, edge trim and control joints.
 - b. Gypsum board screws, ASTM C 1002.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Steel Framing: Install steel framing in compliance with ASTM C 754. Install with tolerances necessary to produce substrate for gypsum board assemblies with tolerances specified. Include wall reinforcing for casework, wall cabinets, wall mounted shelving and drying racks.
- B. Tape and Joint Compound: Install gypsum board for tape and 3-coat joint compound finish in compliance with ASTM C 840 and GA 216, Level 4 finish. Install gypsum board assemblies true, plumb, level and in proper relation to adjacent surfaces.
- C. Install boards vertically. Do not allow butt-to-butt joints and joints that do not fall over framing members.
- D. Where new partitions meet existing construction, remove existing cornerbeads to provide a smooth transition.
- E. Provide insulation full height and thickness in partitions where required.
- F. Provide siliconized acrylic sealant at both faces at top and bottom runner tracks, wall perimeters, openings, expansion and control joints.
- G. Install trim in strict compliance with manufacturer's instructions and recommendations.
- H. At areas to be patched and repaired, prepare surface to sound substrate, apply bonding agent and patching materials in accordance with manufacturer's instructions.
- I. Clean adjacent surfaces soiled during installation. Touch-up damaged surfaces. Protect work from damage. Repair surface defects. Leave ready for finish painting or wall treatment.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide non-structural metal framing for gypsum board assemblies.
- B. Related Sections include the following:
 - 1. Division 12, Section "Painted Metal Laboratory Casework".
 - 2. Division 8, Section "Hollow Metal Door and Door Frames".
 - 3. Division 9, Section "Gypsum Board Assemblies" for wall reinforcing.
 - 4. Division 10, Section "Fire Protection Specialties".
 - 5. Division 11, Section "Lab Accessories".

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Tolerances: Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.
- C. Fire Resistance for Fire-Rated Assemblies: ASTM E 119.
- D. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Framing for Walls and Partitions:
 - 1. Manufacturers: Brady Construction Corp., Chicago Metallic Corp., Clark Dietrich, MBA Metal Framing, Ruskin Corp.
 - 2. Material Standard: ASTM C645.

3. Stud Thickness: 20 gauge (.0329 inch).
4. Stud Depth, Typical: 3-5/8 inches.
5. Auxiliary Framing Components: Furring brackets, resilient furring channels, Z-furring members, and non-corrosive fasteners.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide fire-rated systems where indicated and where required by authorities having jurisdiction.
- B. Where new partitions meet existing construction, remove existing cornerbeads to provide a smooth transition.
- C. Provide acoustical sealant at both faces at top and bottom runner tracks, wall perimeters, openings, expansion and control joints.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Provide acoustical ceilings and suspension systems:
 - 1. (ACT-1) and (ACT-2) Acoustical ceiling panels.
 - 2. (ACG-1) Exposed grid suspension system.
 - 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- B. Related Sections:
 - 1. Division 9, Section "Gypsum Board Assemblies".
 - 2. Division 23 - Mechanical Work
 - 3. Division 26 - Electrical Work

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. Extra Stock: Submit extra stock equal to 2 percent of amount installed.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Comply with governing codes and regulations. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's

instructions.

- C. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities. Acoustical performance based on project requirements.
 - D. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less
 2. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which acoustical ceilings function as a fire protective membrane and tested per ASTM E 119.
 - a. Protect lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
 - E. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
10. ASTM E 1264 Classification for Acoustical Ceiling Products.
11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Manufacturer's written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions. Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.8 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
 2. Grid System: Rusting and manufacturer's defects
 3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
- B. Warranty Period:
1. Acoustical panels: Ten (10) years from date of substantial completion.
 2. Grid: Ten (10) years from date of substantial completion.
 3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 5.0 percent of amount installed.
 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Mineral Fiber Acoustical Ceilings:
1. Manufacturers:
 - a. Armstrong World Industries.
 - b. USG.
 - c. Celotex.

2. Design standard is Armstrong:
 - a. (ACT-1) Offices, Cubicles and Conference Room: Match building standard 24X24 tile.
 - b. (ACT-2) Tissue Culture, Microscopy and Sequencing: Ultima Health Zone NRC.

2.2 ACOUSTICAL CEILING UNITS

A. Acoustical Panels:

1. ULTIMA Health Zone High NRC:
 - a. Sound Absorption (NRC) 0.80
 - b. Sound Blocking (CAC) 35
 - c. Light Reflectance 86%
 - d. Sag/Humidity Resistance HumiGuard Plus
 - f. Fire Performance Class A (UL)
3. Surface Texture: Fine.
4. Composition: Mineral Fiber.
5. Color: White.
6. Size: 24-in X 24-in X 1-in.
 7. Edge Profile: Square Lay-In. Painted.
 8. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton.
 9. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton.
 10. Emissions Testing: Section 01350 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality".
 11. Flame Spread: ASTM E 1264; Fire Resistive.
 12. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance.
 13. Dimensional Stability: - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning.
 14. Antimicrobial Protection: Inherent - Resists the growth of mold/mildew and bacterial growth.

2.3 SUSPENSION SYSTEMS

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with 15/16 IN type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
1. Structural Classification: ASTM C 635 HD.
 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 3. Design standard is Prelude 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.
- D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
- E. Accessories
1" Flush "T" Act. to Drywall Transition Molding

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

- A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.
- C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
 - 1. Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide resilient flooring and floor preparation.
- B. Related Sections include the following:
 - 1. Division 9, Section "Gypsum Board Assemblies".
 - 2. Division 9, Section "Resilient Base and Accessories".
 - 3. Division 12, Section "Painted Metal Laboratory Casework".

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Extra Stock: Submit extra stock equal to 2% of total used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Performance: Fire performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Vinyl Composition Tile Flooring:
 - 1. Manufacturers: match existing building standard.
 - 2. Type: Vinyl Composition Tile: ASTM F 1066, Class 2 through-pattern.
 - 3. Color: See schedule on architectural plans, match existing building standard.
 - 4. Size: 12 by 12 inches.
 - 5. Thickness: 1/8 inch.
 - 6. Adhesive: As per manufacturer's recommendations, Henry's 430 is

- WSU's preferred adhesive.
7. Auxiliary Materials:
 - a. Edge strips and terminations.
 - b. Leveling compound.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations. Install in proper relation to adjacent work.
- B. Prepare surfaces by cleaning, leveling and priming as required. Test adhesive for bond before general installation. Level to 1/8' in 10' tolerance.
- C. Tile Flooring: Install tile with tight joints and with one-way pattern. Layout to prevent less than 1/2 tile units.
- D. Sheet Flooring: Install sheets with tight joints and pattern in adjoining areas running in the same direction. Layout to minimize seams as approved.
- E. Clean, polish, and protect.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Provide resilient wall base and accessories.
- B. Related Sections include the following:
 - 1. Division 9, Section "Gypsum Board Assemblies".
 - 2. Division 9, Section "High Performance Coatings".
 - 4. Division 12, Section "Painted Metal Lab Casework".

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Submit extra stock equal to 2% of total used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Performance: Fire performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Resilient Wall Base:
 - 1. Manufacturers:
 - a. Armstrong World Industries.
 - b. Nora Rubber.
 - c. Flexco.
 - d. Roppe.
 - e. Johnsonite.

- f. Mannington.
 - g. Commercial Resilient.
 - h. Mercer Products.
 - i. NAFCO.
 - j. VPI Floor Products.
- 2. Color: See schedule on architectural plans.
 - 3. Standard: ASTM F 1861.
 - 4. Type: TS (rubber, vulcanized thermoset).
 - 5. Style: Straight.
 - 6. Thickness: 0.125 inch
 - 7. Height: 4 inches.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations. Install in proper relation to adjacent work.
- B. Install base and accessories to minimize joints. Install base with joints as far from corners as practical.
- C. Clean, polish, and protect.

END OF SECTION

SECTION 09 68 13

CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. (CPT-1) Provide carpet and floor preparation as per Architect's finish schedule on drawings.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Extra Stock: Submit extra stock equal to 2% of total used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Performance: Fire performance meeting requirements of building code and local authorities.
- C. Provide all materials, components and accessories for a complete installation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. CPT-1 Carpet: Provide carpet as per Architect's finish schedule on drawings.
 - 1. Manufacturers: match existing building standard.
 - 2. Approved Manufacturers: match existing building standard.
 - 3. Product: match existing building standard.
 - 4. Color and Pattern: match existing building standard.
 - 5. Installation Method: Manufacturer's recommended pressure sensitive adhesive.
 - 6. Auxiliary Materials:

- a. Edge guards.
- b. Adhesives, cements and fasteners.
- c. Leveling compound.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with recommendations of Carpet and Rug Institute "Specifier's Handbook".
- B. Comply with manufacturer's preparation, installation and care instructions.
- C. Provide all materials, components and accessories for a complete installation.
- D. Prepare surfaces and install materials in accordance with manufacturer's instructions and approved submittals. Clean, patch, and level substrate. Install materials in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- E. Install edge guards and reducer strips as required; clean and protect.

END OF CARPETING

SECTION 09 72 00

WALL COVERING

PART 1 GENERAL

1.1 SUMMARY

- A. Provide wall coverings and surface preparation.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Extra Stock: Submit extra stock equal to 2 unopened rolls of each type of wall covering used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Performance: Fire performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Vinyl Wall Covering:
 - 1. Manufacturers: 3M Architectural Markets.
 - 2. Stain Resistance: Factory applied polyvinyl fluoride or polymer coating.
 - 3. Serviceability: ASTM F 793 for peelable or strippable wall coverings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Acclimatize materials; prime and seal substrates; test substrates for moisture content and prepare surfaces in compliance with manufacturer's recommendations.
- B. Install in accordance with manufacturer's instructions. Apply adhesive and install with seams plumb and overlapped and double-cut to ensure tight

closure except where pattern would not match. Do not place seams within 6" of corners.

- C. Remove air bubbles, blisters, wrinkles and other defects; horizontal seams are not permitted. Remove excess adhesive immediately; clean walls and protect surfaces.

END OF SECTION

SECTION 09 91 00

PAINTS

PART 1 GENERAL

1.1 SUMMARY

- A. (PNT-1) and (PNT-5) Provide painting and surface preparation.
- B. Related Sections include the following:
 - 1. Division 8, Section "Hollow Metal Door and Door Frames".
 - 2. Division 9, Section "Gypsum Board Assemblies".

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
 - 1. Include manufacturers full range of color and finish options if additional selection is required.
- C. Extra Stock: Submit 1 unopened gallons of each paint and color used in the project.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Regulations: Compliance with VOC and environmental regulations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. (PNT-1) Painting – Walls and Ceiling: interior wall and ceiling surfaces.
 - 1. Manufacturers:
 - a. Sherwin Williams.
 - b. Pratt & Lambert.
 - c. Benjamin Moore.
 - d. ICI Paint Stores.
 - e. PPG Architectural Finishes.
 - 2. Primary Coating Type: Low VOC water-based epoxy paints.
 - 3. Gypsum Board Walls in Rooms and Corridors:

- a. Paint Systems: Primer plus two finish coats.
 - b. Finish: Water-based epoxy paint with a eggshell finish, except toilet rooms, laboratories and storage rooms to be satin finish.
 - c. Color: Refer to architectural plans and finish schedule for locations.
4. Masonry Walls:
- a. Paint Systems: Primer with void filler plus two finish coats.
 - b. Finish: Latex enamel paint with an eggshell finish.
 - c. Color: Refer to architectural plans and finish schedule for locations.
- B. (PNT-5) Painting – Interior Hollow Metal Doors and Door Frames:
- 1. Manufacturers:
 - a. Sherwin Williams.
 - b. Pratt & Lambert.
 - c. Benjamin Moore.
 - d. ICI Paint Stores.
 - e. PPG Architectural Finishes.
 - 2. Primary Paint Systems: Rust-inhibiting primer plus two finish coats, sprayed application.
 - 3. Finish: Alkyd based enamel paints with a satin finish.
 - a. Color: Refer to architectural plans and finish schedule for locations.
- C. Fire Rated Assemblies: New and Existing.
- 1. Paint "ONE HOUR RATED in stencil form with letters not less than 1.5" in height and the color red on a white or existing light contrasting background 12" below ceiling/floor deck every 10 feet of continuous wall surface and not less than once in each room adjoining the wall.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Inspect surfaces, report unsatisfactory conditions in writing; beginning work means acceptance of substrate.
- B. Comply with manufacturer's instructions and recommendations for preparation, priming and coating work. Coordinate with work of other sections.
- C. At existing areas to be repainted, remove blistered or peeling paint to sound substrates. Remove chalk deposits and mildew and wash all surfaces with mild detergent. Perform related minor preparation including caulk and glazing compounds. Spot prime bare areas before priming and painting as specified.
- D. Re-coat or remove and replace work which does not match or shows loss of adhesion. Clean up, touch up and protect work.

END OF SECTION

SECTION 09 97 23
RESINOUS FLOORING

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 surface preparation and application of resinous flooring systems.
 - 1. The work shall consist of preparation of the substrate, the furnishing and application of a pigmented epoxy-based floor coating system with urethane topcoat.
 - 2. The system shall have the color and texture as indicated on drawings with a nominal thickness of 23 mils.
 - 3. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
 - a.
- B. Related Requirements:
 - 1. Section 09 91 23, "Interior Painting" for special-use coatings and general field painting.
 - 2. Section 09 96 00, "High Performance Coatings" for special-use coatings and general field painting.

1.3 DEFINITIONS

- A. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.
- B. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.
- C. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.
- D. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523, a high-gloss finish.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. 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 coating system specified in Part 3, with the proposed product highlighted.
 - 3. VOC content.

1.5 CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.6 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. Coatings: 5 percent, but not less than 1 gallon of each material and color applied.

1.7 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Owner will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:

1. Product name and type (description).
2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

B. Storage and Protection

1. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal

1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.9 FIELD CONDITIONS

A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
3. The Applicator shall ensure that adequate ventilation is available for the work area.
4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of concrete to be coated with epoxy material.

1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured a minimum of twenty-eight days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary or desirable).
3. Sealers and curing agents should not to be used.
4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
2. "No Smoking" signs shall be posted at the entrances to the work area.
3. Non-related personnel in the work area shall be kept to a minimum.

PART 2 – PRODUCTS

2.1 FLOORING (EC-1)

- A. Basis of Design Product: Subject to compliance with requirements, provide product indicated: Dur-A-Flex, Inc, Dur-A-Gard, Epoxy-Based seamless flooring system, or comparable product.
 1. System Materials:

- a. Primer: Dur-A-Flex, Inc, Dur-A-Glaze #4 WB resin and hardener.
- b. Base Coat: Dur-A-Flex, Inc, Dur-A-Gard resin and hardener.
- c. Topcoat: Dur-A-Flex, Inc. Armor Top resin, hardener and grit.

2. Patch Materials

- a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze Rapid-Patch.
- b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Dur-A Crete.

2.2 MANUFACTURER

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide product indicated by: Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802, or comparable product from one of the following:

1. Benjamin Moore & Co.
2. Sherwin Williams Company
3. PPG Architectural Finishes, Inc.
4. Tnemec Inc.

B. Manufacturer of Approved System shall be single source.

2.3 PRODUCT REQUIREMENTS

A. Primer	Dur-A-Glaze #4 WB
1. Percent Solids	56 %
2. VOC	2 g/L
3. Bond Strength to Concrete ASTM D 4541	550 psi, substrates fails
4. Hardness, ASTM D 3363	3H
5. Elongation, ASTM D 2370	9 %
6. Flexibility (1/4: Cylindrical mandrel), ASTM D 1737	Pass
7. Impact Resistance, MIL D-2794	>160
6. Abrasion Resistance ASTM D 4060, CS 17 wheel, 1,000 g Load	30 mg loss
B. Base Coat	Dur-A-Gard
1. Percent Solids	100 %
2. VOC	3.45 g/L
3. Compressive Strength, ASTM D 695	16,000 psi
4. Tensile Strength, ASTM D 638	3,800 psi
5. Flexural Strength, ASTM D 790	4,000 psi
6. Abrasion Resistance, ASTM D 4060 C-10 Wheel, 1,000 gm load, 1,000 cycles	35 mg loss
7. Flame Spread/NFPA-101, ASTM E 84	Class A
8. Flammability, ASTM D 635	Self Extinguishing
9. Impact Resistance MIL D-3134	0.025 inch Max

- | | |
|----------------------------------|---------------|
| 10. Water Absorption. MIL D-3134 | 0.04 % |
| 11. Potlife @ 70 F | 20-25 minutes |

C. Topcoat	Armor Top
1. Percent Solids	95 %
2. VOC	0 g/L
3. Tensile Strength, ASTM D 2370	7,000 psi
4. Adhesion, ASTM 4541	Substrate Failure
5. Hardness, ASTM D 3363	4H
6. 60° Gloss ASTM D 523	70
7. Abrasion Resistance, ASTM D4060 CS 17 wheel (1,000 g load) 1,000 cycles	Gloss Satin 4 8 mg loss with grit 10 12 mg loss without grit
8. Pot Life, 70 F, 50% RH	2 Hours
9. Full Chemical Resistance	7 days

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
 - 1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

A. General

- 1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
- 2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
 - b. If the relative humidity exceeds 75% then Dur-A-Flex, Inc Dur-A-Glaze MVP Primer moisture mitigation system must be installed prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.
- 3. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
- 4. Mechanical surface preparation

- a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 3-4 as de- scribed by the International Concrete Repair Institute.
 - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 - c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/8 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
 - d. Cracks and joints (non-moving) greater than 1/8-inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
5. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. General

1. The system shall be applied in four distinct steps as listed below:
 - a. Substrate preparation
 - b. Priming
 - c. Base coat application.
 - d. Topcoat application
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer

1. The primer shall be Dur-A-Glaze #4 WB that is mixed at the ratio of 1 part resin to 4 parts hardener per the manufacturer's instructions.

2. The primer shall be applied by 1/8-inch notched squeegee and back rolled at the rate of 200-250 sf/gal to yield a dry film thickness of 4 mils.

C. Base Coat

1. The base coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer.
2. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
3. The base coat shall be applied over horizontal surfaces using "v" notched squeegee and back rolled at the rate of 100 sf/gal to yield a dry film thickness of 16 mils.

D. Topcoat

1. The topcoat of Armor Top shall be roller applied at the rate of 500 sf/gal to yield a dry film thickness of 3 mils.
2. The topcoat shall be comprised of a liquid resin, hardener and grit that is mixed per the manufacturer's instructions.
3. The finish floor will have a nominal thickness of 23 mils.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
 - a. Temperature
 1. Air, substrate temperatures and, if applicable, dew point.
 - b. Coverage Rates
 1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF RESINOUS FLOORING

SECTION 10 21 23.13

LIGHTPROOF CURTAINS

PART 1-GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Curtains, tracks, curtain carriers, and wall bracket system for lightproof curtains.

1.3 PERFORMANCE REQUIREMENTS

- A. Curtains: Provide curtain with the following characteristics:
 - 1. Fabrics are to be inherently and permanently flame resistant and are identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Identify material with appropriate markings of applicable testing and inspecting agency.

1.4 SUBMITTALS

- A. Product Data: Include durability, fade resistance, and fire-test-response characteristics for each type of curtain fabric indicated.
 - 1. Include data on each type of applied curtain treatment.
- B. Shop Drawings: Show layout with sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
 - 1. Include details on bracketing system.
- C. Coordination Drawings: Plans drawn to scale and coordinating wall-mounted items.
- D. Curtain Schedule: Use same room designations as indicated on Drawings.
- E. Samples for Initial Selection: For the type of curtain fabric indicated.
- F. Product Certificates: Signed by manufacturers of tracks and curtains certifying that products furnished comply with requirements.

- G. Maintenance Data: For tracks and curtains to include in maintenance manuals specified in Division 1.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install curtains until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where curtains are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2-PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. PL System, Inc., New York
www.PLSYS.net
 - 2. Approved equal

2.2 CURTAIN TRACKS

- A. Provide complete track assembly including the suspension system, and all required valance support channels, curtain tracks, curtain carriers, end caps, connectors, fittings, and fasteners.

2.3 CURTAINS

- A. Curtains shall be of a blend of self extinguishing fabric (SEF), saram flat monofilament, viscose rayon and polyester. Material to have a double-black color laminated back. Note: double-coated vinyl cloth will not be acceptable.
 - 1. Color of curtain material shall be Black, both sides
- B. Curtain shall be is custom designed to the width of the opening permitting movement of curtains in either direction of the track.
 - 1. The outside vertical edges of each curtain are supplied with "Velcro" quick seal strips to facilitate "light-trap" overlaps for easy attachment to walls.
 - 2. The curtain panel shall be sewn flat plus 10% fullness. The seams shall be sewn French-style (No raw edges visible).

3. The top of the curtain shall have grommets on 8" centers. The bottom edge shall be weighted and overlap with floor approximately 2"..
- C. Valences: Each curtain section is to be supplied with front and rear light-trap valance. Valences are configured one on the outside of the track and one on the inside of the track height 11 inches. The valance shall be made of the same blackout curtain material, with a sewn-on Velcro strip, and shall be mounted to the curtain track assembly using Velcro supplied with track.
- D. Track: The track is to be constructed of satin anodized aluminum designed for surface mounting. The track is extruded aluminum box-channel 1-1/4" x 7/8" slotted on the underside to receive two-wheeled carriers. The track also serves as an integral part of the valance assembly. Fastening should be made not more than 18" on centers. Corners, where required, are supplied as one piece, 12" radius 90-degree track sections. Tracks are supplied, as required, with hook carriers, end caps, snap-outs, and connectors, of the sleeve type. The hooks are formed of rustproof wire riding in a carrier with non-wearing nylon wheels.

PART 3-EXECUTION

3.1 INSTALLATION

- A. General: Install tracks level and plumb, according to manufacturer's written instructions. Provide track fabricated from one continuous length up to 16 feet (4.9 m).
 1. Curtain Track Mounting: As indicated on Drawings.
- B. Surface Track Mounting: per manufacturer's instructions.
- C. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
- D. Curtains: Hang curtains on each curtain track.

3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain safety loading units.
 1. Train Owner's maintenance personnel on procedures and schedules for changing curtains and maintaining cubicles.
 2. Schedule training with Owner with at least seven days' advance notice.

END OF SECTION

SECTION 10522

FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers
 - 2. Cabinets for portable fire extinguishers
- B. Related Sections include the following
 - 1. Section 09 21 16 - Gypsum Board Assemblies
 - 2. Section 09 22 16 - Non-structural Metal Framing
 - 3. Section 09 91 00 - Paints

1.02 REFERENCES

- A. American Disability Act (ADA), ANSI A 117.1 – Accessible and Usable Buildings and Facilities
- B. American Society for Testing and Materials (ASTM)
 - A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
 - C1036 Standard Specification for Flat Glass
 - E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- C. Federal Standard (FED-STD)
 - FED-STD-795 Uniform Federal Accessibility Standards (UFAS)
- D. National Fire Protection Association (NFPA)
 - NFPA 10 Portable Fire Extinguishers
- E. International Building Code (IBC)

F. International Fire Code (IFC)

1.03 SUBMITTALS

A. Submit brochure and product data.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

1.04 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10.

B. Fire Extinguishers: Listed and labeled by Underwriter's Laboratory (UL) or Factory Mutual (FM) for type, rating, and classification.

C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirement as applicable.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. J.L. Industries, Inc. a division of Activar Construction Products Group
2. Larsen's Manufacturing Co.
3. Potter Roemer LLC
4. Kidde Residential and Commercial Division, subsidiary of Kidde plc.

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A1008/A1008M, commercial quality, stretcher leveled, temper rolled.

2.03 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.

1. Product: A 10-lb, multi-purpose, UL listed, dry chemical fire extinguisher with a minimum rating of Class A-B-C.

B. Mounting Brackets: Manufacturer's standard steel bracket, designed to secure extinguisher, of sizes required for types and capacities of fire extinguisher indicated, with plated or baked-enamel finish.

- C. Fire extinguishers installed outside shall be located in approved weather-tight fire extinguisher cabinets.

2.04 FIRE EXTINGUISHER CABINETS

- A. General: Unless specified otherwise on construction drawings, provide fire extinguisher cabinet of type, size, and rating as indicated below, or equivalent.
 - 1. Semi-recessed mounted as indicated on drawings.
- B. Cabinet Size: The minimum inside box dimensions shall be 24"H x 9½"W x 6"D for SNL Type I and Type III fire extinguishers, and 27"H x 12"W x 8"D for SNL Type II fire extinguishers.
- C. Cabinet Construction: Provide manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- D. Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E814 for fire-resistance rating of wall where it is installed. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch (1.2-mm) thick, cold-rolled steel sheet lined with minimum 5/8-inch (16-mm) thick, fire-barrier material. Provide factory drilled mounting holes.
 - 1. Cabinet Metal: Enameled-steel sheet.
 - a. Provide FX option where located in rated walls.
 - 2. Shelf: Same metal and finish as cabinet.
- E. Cabinet Mounting: Suitable for the following:
 - 1. Recessed: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
 - 2. Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.
 - 3. Surface Mounted: Cabinet box fully exposed and mounted directly on wall.
- F. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded and ground smooth.
- G. Cabinet Trim Material: Steel sheet.
- H. Door Material: Steel sheet.
- I. Door Glazing: Clear Float Glass, ASTM C1036, Type 1, Class 1
- J. Door Style: Vertical side glass panel with frame.

- K. Door Construction: Provide a minimum ½-inch (13 mm) thick door frames.
- L. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide recessed door pull and friction latch. Provide continuous-type hinge permitting door to open 180 degrees.
- M. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the exterior and interior of the cabinet and doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed. Verify that rough openings for cabinets are correctly sized and located.
- B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF FIRE EXTINGUISHERS

- A. Comply with manufacturer's written instructions for installing fire extinguishers and mounting brackets.
- B. Mounting Height: Install extinguishers at heights indicated below.
 - 1. Install fire extinguishers mounted on hangers or brackets attached to a wall so that the top of the fire extinguisher is not more than 3½ ft. above the floor.
 - 2. In no case shall the clearance between the bottom of the fire extinguisher and the floor be less than 4 inches.
- C. Locations: Install extinguishers at locations indicated below.
 - 1. Install fire extinguishers at locations specified on the drawings or as directed by the authority having jurisdiction.
 - 2. Fire extinguishers shall be conspicuously located, along normal paths of travel, including exits from areas. Extinguishers shall not be obstructed or obscured from view.
- D. Install portable fire extinguishers on the hanger or in the bracket supplied, or place in the fire extinguisher cabinets provided. Verify that the extinguisher operating instructions face outward.

3.03 INSTALLATION OF FIRE EXTINGUISHER CABINETS

- A. Comply with manufacturer's written instructions for installing fire extinguisher cabinets.
- B. Mounting Height: Install fire extinguisher cabinets at the height required so that the top of the fire extinguisher is not more than 54 inches above the floor.
- C. Install fire extinguisher cabinets at locations specified on the drawings.
- D. Fire extinguisher cabinets shall protrude no more than 4 inches into corridors, passageways, or aisles.
- E. Repair/paint wall surfaces surrounding fire extinguisher cabinet damaged during installation to match existing wall surface.

3.04 SIGNAGE

- A. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.
- B. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
 - 1. Application Process: Decals
 - 2. Lettering Color: Red
 - 3. Orientation: Vertical

3.05 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Construction Completion.

END OF SECTION

SECTION 11 53 33

LABORATORY SAFETY EQUIPMENT

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

This Section includes laboratory safety equipment including emergency eyewashes, showers and other related products.

- A. Extent and types of safety equipment as indicated on Laboratory Equipment drawings.
- B. Provide safety equipment as specified herein and as indicated on Laboratory Equipment drawings.
- C. Related Sections include the following:
 - 1. Division 11, Section 116622 "Laboratory Accessories".
 - 2. Division 12, Section 12352, "Painted Metal Laboratory Casework".
 - 3. Divisions 22 and 26, Sections for plumbing and electrical requirements.
 - 4. Divisions 22 and 26, Sections for final connections to building services and systems.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide certification that fixtures and fittings have been tested in accordance to and meet the performance requirements as described in SEFA 7.
- B. Chemical Resistance: All coating materials shall meet the following tests for chemical resistance:
 - 1. Fume Test: Suspend coated samples in a container at least 6 cubic feet capacity, approximately 12" above open beakers, each containing 100 cc of 70% nitric acid, 94% sulfuric acid and 35% hydrochloric acid, respectively. After exposure to these reagent fumes for 150 hours, the finish on the samples shall show no discoloration, disintegration or other damage to the coating.
 - 2. Direct Application Test: The test of coated samples shall consist of the direct action of the reagents listed below. This test is to be conducted in such as manner that the test surface is kept wet throughout the entire test period and at a controlled temperature of 77 degrees F +/- 3 degrees F. The test must be conducted for a period of not less than one

hour. As a result of the test the coating on the samples shall not rupture or otherwise compromised exposing the base material through erosion, dissolution, cracking, splitting or other damage resulting from reagent exposure. Obvious and significant deterioration is not acceptable. However, slight discoloration or temporary softening of the coating is permissible.

Acetic Acid, 98%	Lactic Acid, 10%
Acetone	Methanol
Acid Dichromate, 5%	Methyl Alcohol
Ammonium Hydroxide, 28%	Methyl Ethyl Ketone
Amyl Acetate	Methylene Chloride
Amyl Alcohol	Mineral Oil
Benzene	Mono Chlorobenzene
Butyl Alcohol	N-Hexane
Calcium Hypochlorite	Naphthalene
Carbon Disulfide	Nitric Acid, 70%
Carbon Tetrachloride	Perchloric Acid, 70%
Chloroform	Phenol
Chronic Trioxide Acid	Phosphoric Acid, 85%
Cresol	Sea Water
Crude Oil	Silver Nitrate, Saturated
Dichlor Acetic Acid	Sodium Bichromate, Saturated
Dimethylformamide	Sodium Carbonate, 10%
Dioxane	Sodium Chloride, 20%
Distilled Water	Sodium Hydroxide, 50%
Ether	Sodium Hydroxide, Flake
Ethyl Acetate	Sodium Hypochlorite
Ethyl Alcohol	Sodium Sulfide, Saturated
Ethyl Ether	Sulfuric Acid, 96%
Formaldehyde, 37%	Sulfuric Acid 77% & Nitric Acid 70%, eq. parts
Formic Acid, 90%	Toluene
Furfural	Trichloroethylene
Gasoline	Turpentine
Glacial Acetic Acid, 99.5%	Urea, Saturated
Glycerin	Xylene
Hydrochloric Acid, 38%	Xylem
Hydrofluoric Acid, 48%	Zinc Chloride, Saturated
Hydrogen Peroxide, 5%	
Iodine, Tincture of	
Isopropyl Alcohol	
Kerosene	

3. Adhesion Test: Corrosion resistant finishes shall meet the standards set forth in "Standard Test Methods for Measuring Adhesion by Tape Test", ASTM D3359-02, "Standard Test Method for Mandrel Bend Test of Attached Organic Coatings", ASTM D522-93a and "Standard Test Method for Chipping Resistance of Coatings", ASTM D3170-03.
4. Mar and Abrasion Resistance: Coating material shall have a pencil hardness of 2H-4H with adhesion substantial enough to withstand both direct and reverse impacts of 160 inch-pounds. Coating shall have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

5. **Reparability:** Coating material shall be capable of surface repair in the event that a fixture is scratched or a surface rupture occurs. The service fixture manufacturer shall have available an air-drying aerosol coating, specially formulated to match the existing epoxy coating color, which may be applied in the field to repair coated surfaces.

1.4 SUBMITTALS

- A. **Product Data:** Submit manufacturer's data and installation instructions for each type of emergency fixture.
 1. Include independent laboratory certification that applied finish complies with specified chemical and physical resistance requirements.
 2. Submit samples when requested by Laboratory Architect, complete with fittings and accessories with specified finish.

1.5 EXTRA MATERIALS

- A. Provide to Owner a complete touch-up kit for surface repair of emergency fixtures. Provide an air drying aerosol or liquid coating specially formulated to match the coating color which can be applied in the field to repair coated surfaces.

1.6 QUALITY ASSURANCE

- A. **Single Source Responsibility:** All laboratory safety equipment, including those provided as an integral part of other laboratory equipment such as fume hoods, shall be the product of one service fixture manufacturer, unless specified otherwise.
- B. All fixtures shall be in accordance with IBC, NFPA and OSHA for the intended use.
- C. All emergency eye wash and shower equipment shall be certified to comply with ANSI Z358.1-2014.
- D. All fixtures shall comply with the ADA requirements of Section 309.4 of ANSI/ICC A117.1-2009, where a fixture is to be ADA compliant, the maximum force required to open or close a manually activated fitting shall not exceed 5 lbs.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. All mechanical laboratory service fixtures shall be the product of one of the following:
 1. Chicago Faucet
 2. Guardian Equipment
 3. Water Saver Faucet Co.
 4. Far laboratory Faucets Ltd.

2.2 FABRICATION; GENERAL

- A. All laboratory service fixtures shall have the construction and shall meet the performance requirements set forth in this specification. Fixture types shall be as indicated in the fixture schedule on the Laboratory Equipment drawings and fixture details as an attachment to this specification.
- B. Emergency Fixtures: Provide all emergency fixtures factory assembled, including the assembly of all valves, flanges, and other mounting accessories. Individually factory test each fixture and provide all fixtures complete with washers, locknuts, unions, nipples and other accessories.
- C. Material and Finish: Fabricate service fixtures from cast brass containing a minimum of 85% copper or forged brass containing a minimum of 60% copper.
 - 1. Safety equipment as follows:
 - a. Satin Chrome Finish with Clear Epoxy Coating: All components shall be polished and electroplated with one layer of nickel. Exposed surfaces shall then be further polished to an AISI No. 6 brushed finish which is fine-grained and uniform. Components shall then be electroplated with one layer of chrome. Following chrome plating, surfaces to be coated shall be cleaned and degreased. Following plating and cleaning a clear epoxy coating shall be applied to all exposed surfaces and fully baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils.
- D. Safety Equipment:
 - 1. Finish: The exposed metal components of the safety equipment shall be:
 - a. Stainless steel.
 - 2. Provide emergency eye/face wash, drench hose and shower units with spray-type outlet heads to deliver a soft, wide, high volume spray of water. Safety equipment locations are indicated on the Laboratory Equipment drawings. Provide all piping and accessories for a complete installation.
 - 3. Dual Purpose Eye Wash/Drench Hose Units: Deck mounted eye wash/drench hose units shall be capable of use as a fixed eye wash with hands-free operation or as a drench hose. Units shall have two Gentle Spray outlet heads mounted parallel and angled forward, each with a self-regulating volume control, reticulated polyurethane filter and removable spray cover. Dust covers shall be hinged swing-away style and shall be permanently attached to the spray head with a stainless steel pin. Units shall be furnished with a deck flange with locator guide to hold the unit facing forward and an 8 ft. reinforced PVC hose.
 - 4. Emergency eyewash units shall have the following:
 - a. Controlled, low velocity flow completely rinses eyes and face and is not injurious to user.

- b. Hands free stay open ball valve activating within one second or less.
- c. Eyewash unit must be capable of delivering at least 0.4 gpm for 15 minutes.
- d. The nozzles must be protected from airborne contaminants.

PART 3 - EXECUTION

3.1 INSTALLATION OF SERVICE FIXTURES

- A. Install in a precise manner in accordance with manufacturer's directions. Adjust moving parts to operate freely without excessive bind.
- B. Follow the manufacturer's recommended test and working pressures for fittings. Testing or using a fitting at pressure for which it is not designed can result in leakage or failure.
- C. Provide all interconnecting conduit, wiring, and devices to junction box for final connection to building systems by Electrical Trades Contractor.

3.2 REPAIRING, CLEANING, AND PROTECTION

- A. Repairing: Repair or remove and replace defective work as directed upon completion of installation.
- B. Cleaning: Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Laboratory Architect.
- C. Protection: Advise Contractor of procedures and precautions for protection of installed laboratory service fixtures from damage by work of other trades.

END OF SECTION

LAC
iDesign Solutions, LLC

- ~~○ EW1028 Eyewash/Drench Hose Unit, Deck Mounted, Ball Valve with Flag Handle~~
- EW1028VB Eyewash/Drench Hose Unit, Deck Mounted, Ball Valve with Flag Handle, Vacuum Breaker



APPLICATION: Dual purpose eyewash/drench hose unit for deck mounting. Unit meets the provisions of ANSI Z358.1 -2004 as both an eyewash and a drench hose. Unit may be left in the deck flange for use as a fixed eyewash, leaving user's hands free. Alternatively, unit may be removed for use as a drench hose to rinse any part of user's eyes, face or body.

SPRAY HEAD ASSEMBLY: Two GS-Plus™ spray heads mounted side-by-side. Each head has a "flip top" dust cover, internal flow control and filter to remove impurities from the water flow.

VALVE: 1/2" IPS brass stay-open ball valve. EW1028 has valve mounted above counter and activated by flag handle.

HOSE: 8' reinforced PVC hose. 300 PSI maximum working pressure.

MOUNTING: Eyewash assembly has deck flange for countertop mounting. Flange has handle locator guide to position spray heads facing forward at all times.

SUPPLY: 1/2" NPT male inlet.

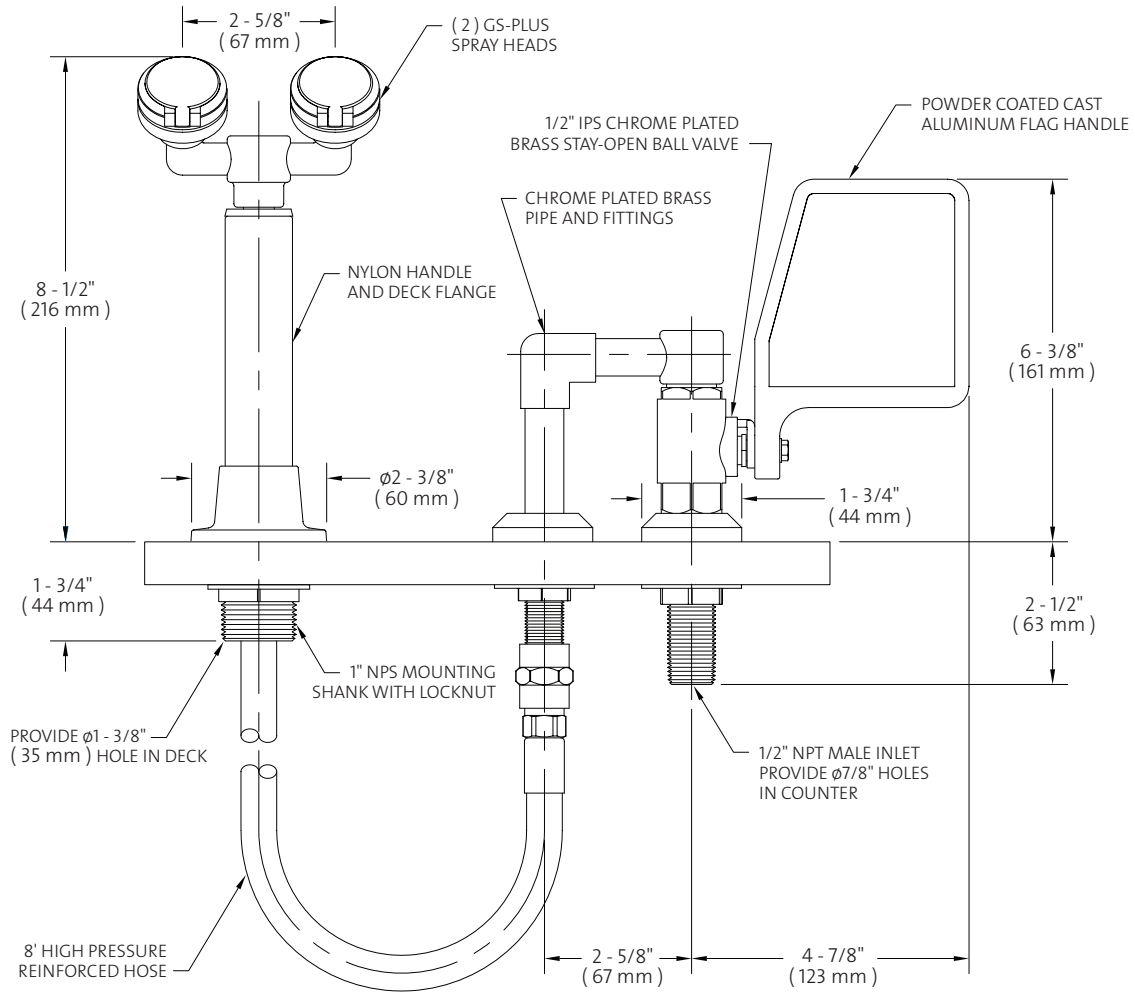
SIGN: ANSI-compliant identification sign.

QUALITY ASSURANCE: Unit is completely assembled and water tested prior to shipment.

Available Options

- **DC** Stainless steel dust cover for each spray head.
- **FSH** 8 ft. flexible stainless steel hose in place of PVC hose.
- **HG** Undercounter hose guide bracket to prevent hose from tangling or binding.
- **BP** In-line dual check backflow preventer installed on inlet of hose. *Note: Check with code authority for compliance with local plumbing code.*
- **VB** Atmospheric vacuum breaker installed on outlet of ball valve (EW1028VB).
- **TMV** AP3600 thermostatic mixing valve precisely blends hot and cold water to deliver warm (tepid) water as provided by ANSI Z358.1 - 2004. Refer to "Tempering Units" section for complete technical and product selection information.

- **EW1028** Eyewash/Drench Hose Unit, Deck Mounted, Ball Valve with Flag Handle
- **EW1028VB** Eyewash/Drench Hose Unit, Deck Mounted, Ball Valve with Flag Handle, Vacuum Breaker



NOTES:

1. EACH GS-PLUS SPRAY HEAD HAS A "FLIP-TOP" DUST COVER, INTERNAL FLOW CONTROL AND FILTER TO REMOVE IMPURITIES FROM THE WATER FLOW.
2. HOSE SHOULD NOT BE USED IN APPLICATIONS WHERE WATER PRESSURE EXCEEDS 90 PSI. HOSE SHOULD BE INSPECTED PERIODICALLY FOR DETERIORATION.
3. UNIT FURNISHED FOR MOUNTING ON COUNTERTOPS FROM $1/8"$ UP TO $1-1/2"$ THICK.

THIS SPACE FOR ARCHITECT/ENGINEER APPROVAL

Due to continuing product improvement, the information contained in this document is subject to change without notice. All dimensions are $\pm 1/4"$ (6mm). rev. 0308

Sign Included



SECTION 11 53 43
LABORATORY SERVICE FITTINGS AND FIXTURES

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 laboratory service fittings and fixtures, also known as valves, for water, vacuum and compressed gas.
- B. Extent and types of laboratory service fixtures and safety equipment as indicated on Laboratory Equipment drawings.
- C. Provide service fittings and fixtures as specified herein and as indicated on Laboratory Equipment drawings.
- D. Related Sections include the following:
 - 1. Division 11, "Laboratory Accessories".
 - 2. Division 12, "Painted Metal Laboratory Casework".
 - 3. Divisions 22 and 26, Sections for plumbing and electrical requirements.
 - 4. Divisions 22 and 26, Sections for final connections to building services and systems.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide certification that fixtures and fittings have been tested in accordance to and meet the performance requirements as described in SEFA 7.
- B. Chemical Resistance: All coating materials shall meet the following tests for chemical resistance:
 - 1. Fume Test: Suspend coated samples in a container at least 6 cubic feet capacity, approximately 12" above open beakers, each containing 100 cc of 70% nitric acid, 94% sulfuric acid and 35% hydrochloric acid, respectively. After exposure to these reagent fumes for 150 hours, the finish on the samples shall show no discoloration, disintegration or other damage to the coating.
 - 2. Direct Application Test: The test of coated samples shall consist of the direct action of the reagents listed below. This test is to be conducted in such as manner that the test surface is kept wet throughout the entire test period and at a controlled temperature of 77

degrees F +/- 3 degrees F. The test must be conducted for a period of not less than one hour. As a result of the test the coating on the samples shall not rupture or otherwise compromised exposing the base material through erosion, dissolution, cracking, splitting or other damage resulting from reagent exposure. Obvious and significant deterioration is not acceptable. However, slight discoloration or temporary softening of the coating is permissible.

Acetic Acid, 98%	Lactic Acid, 10%
Acetone	Methanol
Acid Dichromate, 5%	Methyl Alcohol
Ammonium Hydroxide, 28%	Methyl Ethyl Ketone
Amyl Acetate	Methylene Chloride
Amyl Alcohol	Mineral Oil
Benzene	Mono Chlorobenzene
Butyl Alcohol	N-Hexane
Calcium Hypochlorite	Naphthalene
Carbon Disulfide	Nitric Acid, 70%
Carbon Tetrachloride	Perchloric Acid, 70%
Chloroform	Phenol
Chronic Trioxide Acid	Phosphoric Acid, 85%
Cresol	Sea Water
Crude Oil	Silver Nitrate, Saturated
Dichlor Acetic Acid	Sodium Bichromate, Saturated
Dimethylformamide	Sodium Carbonate, 10%
Dioxane	Sodium Chloride, 20%
Distilled Water	Sodium Hydroxide, 50%
Ether	Sodium Hydroxide, Flake
Ethyl Acetate	Sodium Hypochlorite
Ethyl Alcohol	Sodium Sulfide, Saturated
Ethyl Ether	Sulfuric Acid, 96%
Formaldehyde, 37%	Sulfuric Acid 77% & Nitric Acid 70%, eq. parts
Formic Acid, 90%	Toluene
Furfural	Trichloroethylene
Gasoline	Turpentine
Glacial Acetic Acid, 99.5%	Urea, Saturated
Glycerin	Xylene
Hydrochloric Acid, 38%	Xylem
Hydrofluoric Acid, 48%	Zinc Chloride, Saturated
Hydrogen Peroxide, 5%	
Iodine, Tincture of	
Isopropyl Alcohol	
Kerosene	

3. Adhesion Test: Corrosion resistant finishes shall meet the standards set forth in "Standard Test Methods for Measuring Adhesion by Tape Test", ASTM D3359-02, "Standard Test Method for Mandrel Bend Test of Attached Organic Coatings", ASTM D522-93a and "Standard Test Method for Chipping Resistance of Coatings", ASTM D3170-03.
4. Mar and Abrasion Resistance: Coating material shall have a pencil hardness of 2H-4H with adhesion substantial enough to withstand both direct and reverse impacts of 160 inch-pounds. Coating shall have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

5. **Reparability:** Coating material shall be capable of surface repair in the event that a fixture is scratched or a surface rupture occurs. The service fixture manufacturer shall have available an air-drying aerosol coating, specially formulated to match the existing epoxy coating color, which may be applied in the field to repair coated surfaces.

1.4 SUBMITTALS

- A. **Product Data:** Submit manufacturer's data and installation instructions for each type of service fixture.
 1. Include independent laboratory certification that applied finish complies with specified chemical and physical resistance requirements.
 2. Submit samples of plumbing and electrical service fixtures when requested by Laboratory Architect, complete with fittings and accessories with specified finish.
- B. **Service Color Code:** Submit samples of index disc with letter code in colors used to identify water, vacuum and compressed gas services listed.

1.5 EXTRA MATERIALS

- A. Provide to Owner a complete touch-up kit for surface repair of service fittings and fixtures. Provide an air drying aerosol or liquid coating specially formulated to match the coating color which can be applied in the field to repair coated surfaces.

1.1 QUALITY ASSURANCE

- A. **Single Source Responsibility:** All laboratory service fixtures and safety equipment, including those provided as an integral part of other laboratory equipment such as fume hoods, shall be the product of one service fixture manufacturer, unless specified otherwise.
- B. All fixtures shall be in accordance with IBC, NFPA and OSHA for the intended use.
- C. All fixtures for water service shall meet the requirements of ANSI/ASME A112.18.1M-2012 and be certified by the Canadian Standards Association (CSA) under Standard CAN/CSA B.125.M89.
- D. Atmospheric vacuum breakers shall be certified by the American Society of Sanitary Engineers (ASSE) under Standard 1001 and faucet fixture breakers shall be certified to comply with ANSI/ASSE Standard 1035.
- E. ADA fittings shall comply with the requirements of Section 309.4 of ANSI/ICC A117.1-2014, where a faucet or fitting will be used in an application that is intended to be ADA compliant, the maximum force required to open or close a manually activated fitting shall not exceed 5 lb. (22 N) at 80 PSI (550 kPa) static pressure.

- F. Natural gas service, ball valves shall be certified by the American Gas Association (AGA) under ANSI Z21.15-2009 and the Canadian Gas Association (CGA) 9.1 under CAN/CGA-3.16-M88 (CLIR 36).
- G. Electric pedestal boxes shall be listed by Underwriters Laboratories (UL) under Standard UL514A. Receptacles shall be UL labeled and commercial or specification grade.
- H. The entire installation shall be in accordance with the governing rules and regulations of the National Electric Code, and all local governing boards having jurisdiction and shall meet all the standards and requirements of the Owner.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. All mechanical laboratory service fixtures shall be the product of one of the following:
 - 1. Chicago Faucet
 - 2. Far laboratory Faucets Ltd.
 - 3. Water Saver Faucet Co.

2.2 FABRICATION; GENERAL

- A. All laboratory service fixtures shall have the construction and shall meet the performance requirements set forth in this specification. Fixture types shall be as indicated in the fixture schedule on the Laboratory Equipment drawings and fixture details as an attachment to this specification.
- B. Service Fixtures: Provide all service fixtures factory assembled, including the assembly of all valves and shanks to turrets, flanges, and other mounting accessories. Individually factory test each fixture and provide all fixtures complete with washers, locknuts, unions, nipples and other accessories.
- C. Material and Finish: Fabricate service fixtures from cast brass containing a minimum of 85% copper or forged brass containing a minimum of 60% copper.
 - 1. Finish service fixtures and safety equipment as follows:
 - a. Satin Chrome Finish with Clear Epoxy Coating: All components shall be polished and electroplated with one layer of nickel. Exposed surfaces shall then be further polished to an AISI No. 6 brushed finish which is fine-grained and uniform. Components shall then be electroplated with one layer of chrome. Following chrome plating, surfaces to be coated shall be cleaned and degreased. Following plating and cleaning a clear epoxy coating shall be applied to all exposed surfaces and fully baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils.
 - b. Fittings Inside Fume Hoods: shall have an epoxy finish color-coded to match the fixture service index color. Following base preparation and cleaning, coating

material shall be electrostatically applied to all exposed surfaces. After application, coating shall be fully baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils.

D. Handles: Except as otherwise indicated, provide forged brass four-arm style handles on all fixtures with a color coded screw-on index disc.

1. Benchtop service fixtures at locations identified as accessible (ADA) and or for hand-washing (HW) and where otherwise indicated on lab equipment drawing shall be fitted with 4" wrist blade handles, color coded.
2. Provide foot pedals as indicated on lab equipment drawings.
3. Provide a combination fixture at locations indicating on lab equipment plan which indicates dual functions of both foot pedals and a mixing faucet with 4" wrist blade handles.

E. Water Fixtures and Valves:

1. All fixtures and valves for water service shall have a renewable unit containing all working components subject to wear, including a stainless steel replaceable seat and an integral adjustable volume control. The renewable unit shall be interchangeable among all faucets and valves for water service. The renewable unit shall be broached for position locking in the valve body. The unit shall have a high durometer thermoplastic valve disc and a molded TFE stem packing. The unit shall be capable of being readily converted from compression to self-closing, and vice versa, without disturbing the faucet body.
 - a. Water Fixtures and valves shall be fully assembled and individually factory tested at 80 PSI water pressure.
2. Goosenecks shall have a separate outlet coupling with a 3/8" IPS female thread securely brazed to the gooseneck for attachment of serrated hose ends, aspirators and other outlet fittings. Rigid goosenecks shall have a 3/8" IPS male inlet thread and be threaded directly into the faucet body so as to be absolutely rigid. Swing goosenecks shall utilize a TFE packing with an externally adjustable packing nut.
 - a. Gooseneck faucets at cup sinks (CS-#) and cold water gooseneck fixtures at lab sinks (LS-#) shall have a rigid/swing gooseneck.
 - b. Hot and cold water gooseneck fixtures at lab sinks (LS-#) shall have a rigid/swing gooseneck.
3. Vacuum breakers, where required and indicated by the fixture number, shall be integral with the gooseneck. Vacuum breakers shall have a forged brass body, a renewable seat and an ultralight float cup with a silicone gasket for fine flow control. Vacuum breakers shall not spill over at low water volume.

F. Valves for Gas, Air, Vacuum and Special Gas Service:

1. Needle Valves:

- a. Needle valves shall have a forged brass valve body with a 3/8" IPS female outlet for attachment of serrated hose ends, quick connects or other outlet fittings. Valves shall have a self-centering replaceable stainless steel floating cone and a replaceable stainless steel valve seat. The lateral movement of the cone shall not exceed .0.15". The valve shall have a molded TFE stem packing with an externally adjustable packing nut. The valve shall go from closed to fully open in two full revolutions of the handle.
 - b. Needle valves shall be fully assembled and individually tested at 190 PSI air pressure under water. Maximum working pressure shall be 125 PSI air pressure.
- G. Atmospheric Vacuum Breakers: shall be provided on Fume Hoods with potable water service and where otherwise indicated on the Laboratory Equipment drawings to prevent backflow or backsiphonage into the potable water system. Vacuum breakers shall be installed:
- 1. In accordance with the manufacturer's instructions and applicable plumbing codes.
 - 2. In a location where they are accessible for maintenance.
- H. Service Outlet Identification: The handle of each laboratory fitting, except pressure regulators, shall be marked to indicate the particular liquid or gas that is delivered by or through such fitting. The handle or the index button fastened to the handle shall be color coded, and the index button shall be embossed with identification letters to designate the service. Letters used to designate the service or symbol shall be legible and easy to read. Color code index discs as follows:

Basic Air & Water Indexing	Index Color	Letter Color	Symbol
Purified Air	Orange	Black	PAir
Air	Orange	Black	Air
Compressed Air	Orange	Black	CA
Lab Air	Orange	Black	LA
Cold Water	Dk. Green	White	CW
Chilled Water Supply	Dk. Green	White	CWS
Chilled Water Return	Dk. Green	White	CWR
Industrial Cold Water	Dk. Green	White	ICW
Hot Water	Red	White	HW
Industrial Hot Water	Red	Red	IHW
Steam	Black	White	STM
Tempered Water	Green	White	TW
Glycol Supply	Lt. Green	Black	GYLS
Glycol Return	Lt. Green	Black	GYLR
Process Water Supply	Green	White	PCWS
Process Water Return	Green	White	PCWR
Deionized Water	White	Black	DI
Distilled Water	White	Black	DW

Purified Water	White	Black	PW
Reverse Osmosis	White	Black	RO
High Vacuum	Yellow	Black	HVAC
Low Vacuum	Yellow	Black	LVAC
Vacuum	Yellow	Black	VAC
Gas	Dk. Blue	White	G
Natural Gas	Dk. Blue	White	NG
Acetylene	Violet	White	C2H2
Butane	Lt. Blue	Black	BUT
Isobutene	Silver	Black	ISO
Methane	Lt. Blue	Black	CH4
Propane	Pink	Black	PRO

Gas Indexing	Index Color	Letter Color	Symbol
Ammonia	Lt. Green	Black	NH3
Argon	Violet	White	Ar
Carbon Monoxide	Silver	Black	CO
Carbon Dioxide	Pink	Black	CO2
Helium	Black	White	He
Hydrogen	Pink	Black	H2
Hydrogen Sulphite	Black	White	H2S
Nitrogen	Brown	White	N2
Nitrogen, Dewar	Brown	White	N2d
Nitrous Oxide	Lt.Green	Black	N2O
Oxygen	Lt. Green	Black	O2
Phosphorus	Tan	Black	P
Special Gas	Lt. Blue	Black	SG
Sulphur Dioxide	Tan	Black	SO2

2.3 ELECTRICAL SERVICE FITTINGS

- A. Service Fittings, General: Provide UL-labeled units complying with Division 16 Sections, complete with metal housings, receptacles, terminals, switches, pilot lights, device plates, and accessories and gaskets required for mounting on casework.
1. Pedestal Type Fixtures: Cast aluminum box complete with cover plate(s) and receptacle(s) or other devices as indicated. Boxes shall be machined for both standard and ground fault receptacles. Fabricate units with sloped single face or double face, as indicated. Provide concealed mounting holes in base for attaching to casework and holes tapped for conduits and grounding screws.
 2. Line Type Fixtures: Cast aluminum box with threaded holes for mounting on rigid steel conduit, complete with cover plate(s) and receptacle(s) or other devices as indicated.

3. Recessed Type Fixtures: Galvanized steel outlet box (size as required) complete with cover plate(s) and receptacle(s) or other devices as indicated.
4. Cover Plates: Provide satin finish stainless steel Type 302 cover plates with formed and beveled edges for outlets and devices. Cover plates for receptacles or other devices on emergency circuits shall be finished red and engraved with the word "Emergency" in black filled letters.
5. Finishes for Service Fixture Components: Finish pedestal and line type fixtures and face plates as follows:
 - a. Exposed surfaces of electrical boxes shall have a satin (brushed) aluminum finish.
6. Receptacles: 20 Ampere Grounding Type Duplex Receptacles for 120 Volt, Single Phase Service: Straight blade, 2 pole, 3 wire, NEMA configuration 5-20R, rated 20 amperes, 125 volts, NEMA performance standard grade, for back and side wiring, color to match electrical devices in room.
 - a. Arrow-Hart 5352
 - b. Bryant 5352
 - c. Hubbell 5352
 - d. General Electric 5352
7. Ground Fault Interrupter Duplex Receptacle: 2 pole, 3 wire, grounding type, rated 20 ampere, 125 volt, NEMA configuration 5-20R, 5362 Series, color to match electrical devices in room.
 - a. Arrow Hart
 - b. Bryant
 - c. Hubbell
 - d. General Electric
8. Lighting Switches:
 - a. Switches for Controlling Lighting Directly on AC Systems in General: Toggle operated, specification grade, composition based, extra heavy duty, flush, quiet type, motor rated, with provision for back and side wiring, and rated 20 amperes, 120 volts A.C., color to match electrical devices in room.
 - 1) Arrow-Hart 1991 Series.
 - 2) Bryant, Hubbell, General Electric
9. Electrical Metallic Tubing: Zinc-coated steel per ANSI C80.3-1977 "Specification for Electrical Tubing, Zinc-Coated".
10. Flexible Steel Conduit: Per UL-1, "Flexible Steel Conduit".
11. Couplings and Connectors for EMT: Zinc-plated steel, compression type.
12. Fittings for Flexible Steel Conduit: Malleable iron or steel, zinc or cadmium plated, with insulated throats, securing the conduit by clamping action around the periphery of the conduit. Do not furnish fittings that anchor the conduit by means of set screws.

13. Junction Boxes:

- a. Sheet Metal Boxes: Code gage, full seam welded with bent-in flanges seam welded at corner joints, screw fastened cover of same gage as box. Fasten cover with brass machine screws. Galvanize box and cover after fabrication. Provide sizes conforming to NEC requirements for wiring space. Furnish gaskets when located in areas requiring gaskets.

2.4 WIRES AND CABLES

- A. Furnish wire and cable for standard specifications established for such material and construction by ASTM, ANSI, IPCEA and NEMA, where applicable. Furnish annealed copper conductors of 98% conductivity, not less than NO. 12 AWG. Furnish stranded conductors No. 12 AWG. NEC Type THW rated 75 deg C, 600 volts.
- B. Fume Hood Wiring: Each electrical device shall be wired separately with 2 #12 and 1 #12 ground wire in flexible ½" conduit to a junction box on top of fume hoods or on outside face of the casework back panel (cover accessible from inside casework). Furnish 18" of coiled slack wire pigtail in junction box for extension by Building Trades Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION OF SERVICE FIXTURES

- A. Install in a precise manner in accordance with manufacturer's directions. Adjust moving parts to operate freely without excessive bind.
- B. Follow the manufacturer's recommended test and working pressures for fittings. Testing or using a fitting at pressure for which it is not designed can result in leakage or failure.
- C. Provide all interconnecting conduit, wiring, and devices to junction box for final connection to building systems by Electrical Trades Contractor.

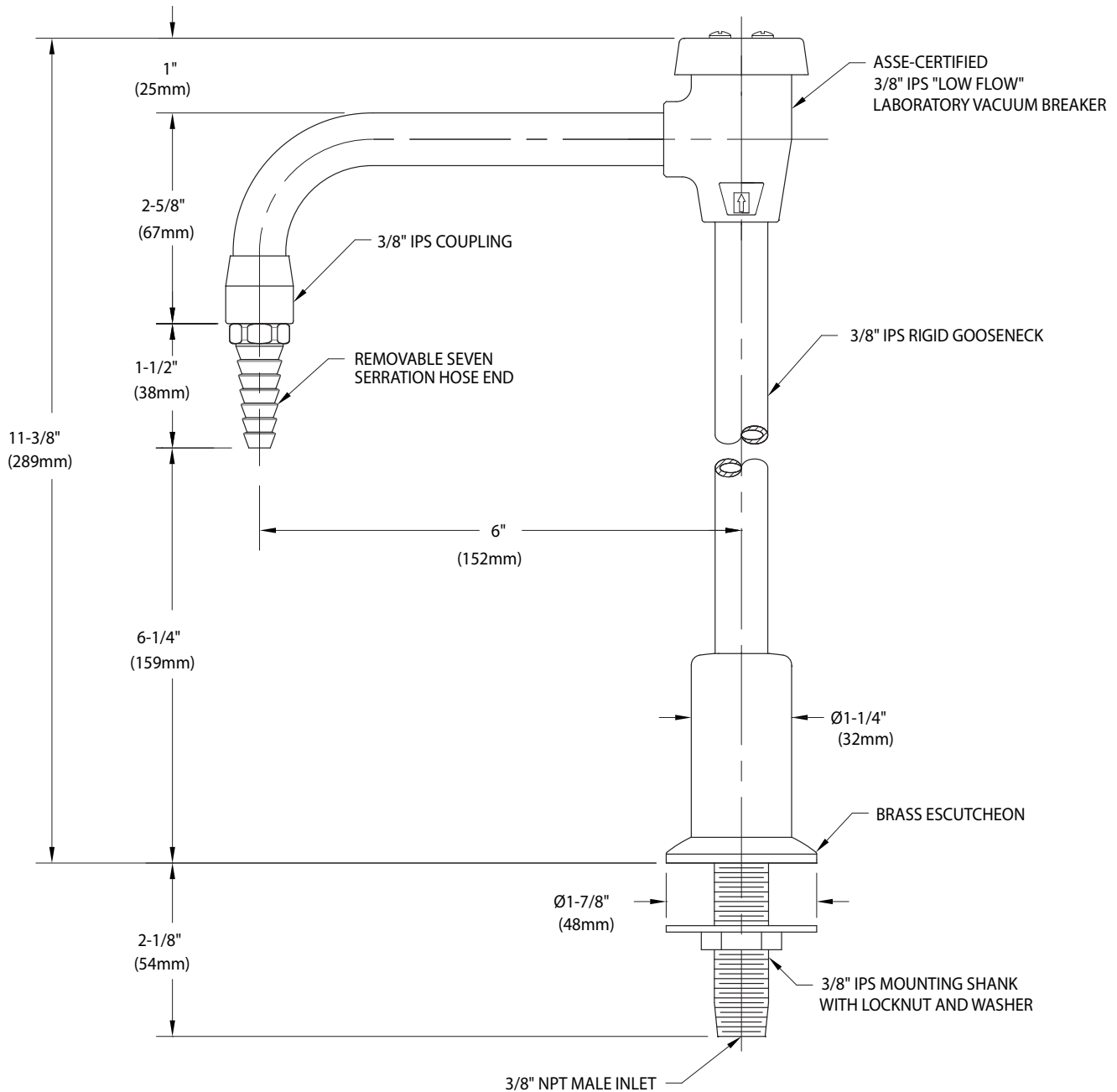
3.2 REPAIRING, CLEANING, AND PROTECTION

- A. Repairing: Repair or remove and replace defective work as directed upon completion of installation.
- B. Cleaning: Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Laboratory Architect.
- C. Protection: Advise Contractor of procedures and precautions for protection of installed laboratory service fixtures from damage by work of other trades.

END OF SECTION

~~L081VB-WSA~~ Outlet Fitting, Deck Mounted, Rigid Vacuum Breaker Gooseneck

L084VB-WSA Outlet Fitting, Deck Mounted, Rigid/Swing Vacuum Breaker Gooseneck

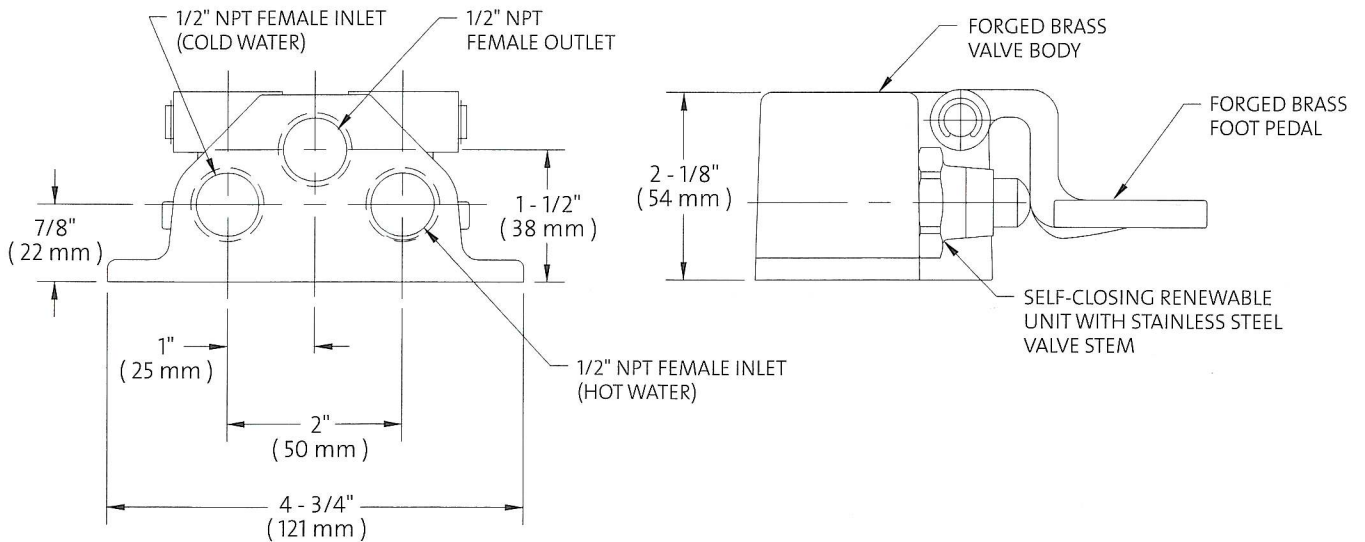
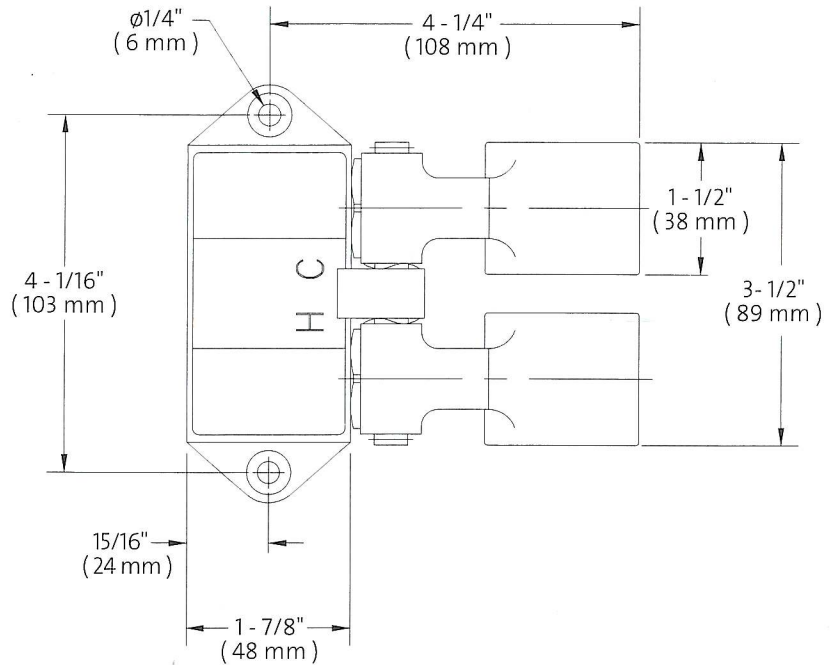


NOTE:
FITTING IS FURNISHED WITH A POLISHED CHROME PLATED OR POWDER-COATED FINISH COLOR-CODED PER SERVICE INDEX COLOR AS STANDARD. OTHER FINISHES ARE AVAILABLE UPON REQUEST.

Measurements may vary $\pm 1/4"$.



L3001 Foot-Operated Mixing Valve, Floor Mounted



NOTE:

1. VALVE IS FULLY ASSEMBLED AND FACTORY TESTED PRIOR TO SHIPMENT

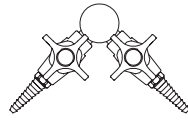
Measurements may vary ± 1/4".



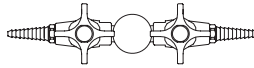
L2880-131WSA Needle Valve Assembly, Deck Mounted Single



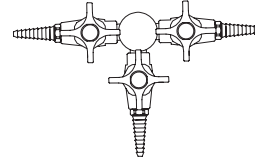
L2880-131WSA
Single
(SF-11)



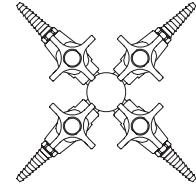
L2880-132AWSA
90° Double
(SF-11-D)



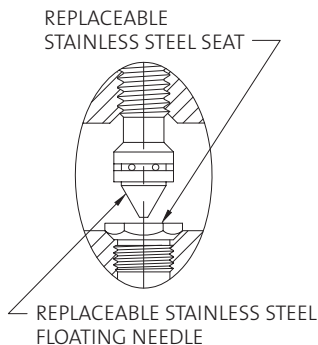
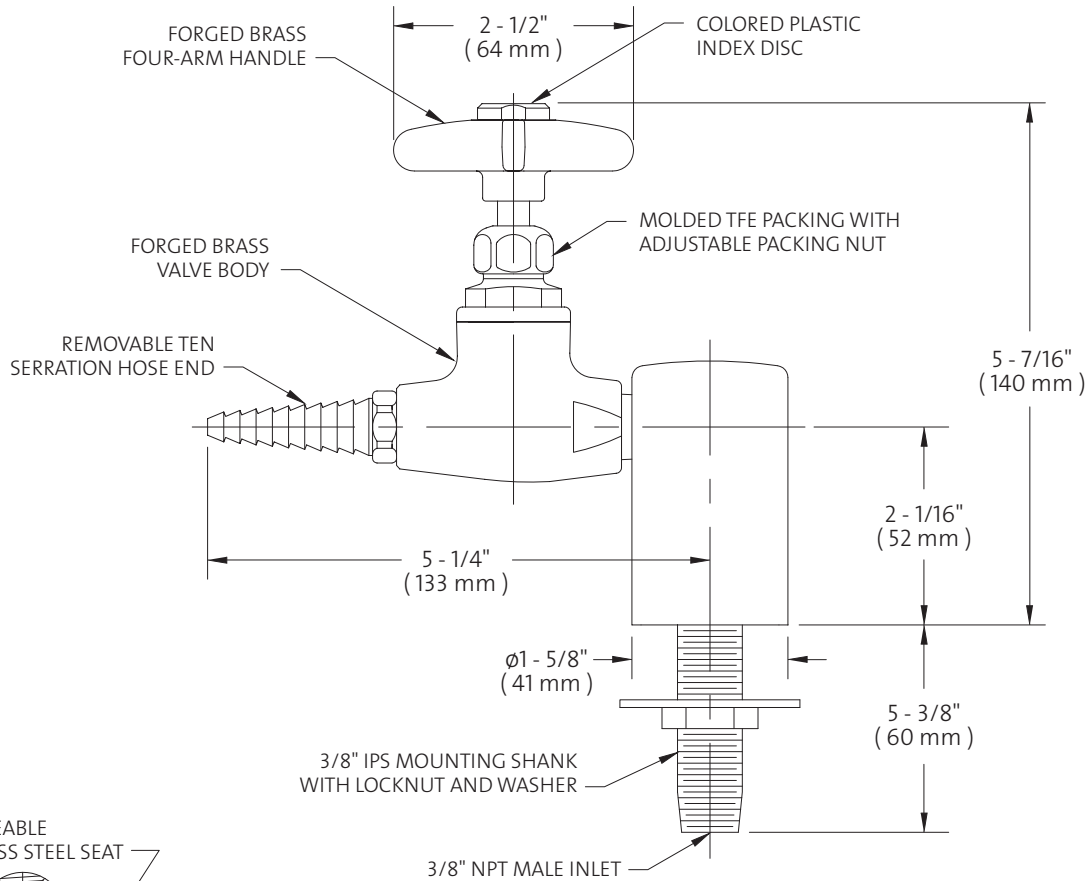
L2880-132SWSA
180° Double
(SF-11-I)



L2880-133WSA
3-Way
(SF-11-T)



L2880-134WSA
4-Way
(SF-11-Q)



NOTES:

1. VALVE IS CERTIFIED BY CSA INTERNATIONAL TO COMPLY WITH ANSI 21.12 AND CGA 9.1.
2. FIXTURE IS FULLY ASSEMBLED AND FACTORY TESTED AT 225 PSI NITROGEN PRESSURE. MAXIMUM WORKING PRESSURE IS 150 PSI.
3. SPECIFY IF CLEANING FOR OXYGEN AND HIGH PURITY GASES IS REQUIRED.

Measurements may vary ± 1/4".

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SECTION 11 53 43.10

LABORATORY 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.
- B. Division 1 Specification Sections for Guiding Principles for High Performance and Sustainable Buildings compliance requirements such as but not limited to Testing for Indoor Air Quality, Sustainable Design Requirements, Commissioning Requirements and Measurement & Verification, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. (P) PHENOLIC RESIN BENCHTOP
 - 2. (LS-#) laboratory sinks.
 - 3. (PB-#) Pegboard glass drying racks.
 - 4. (SC-#) Service chases.
 - 5. (TL-#) Magnetic task light.
 - 6. (CR-1) Gas cylinder restraint straps and racks.
 - 7. (US-#) Unistrut support framing.
 - 8. (LC-2) Lab coat hooks.
 - 9. Concealed steel brackets.
- B. These accessories are part of Alternate No. 6 (Phase 3): Replace sanitary piping in Labs and lab casework to improve water quality in labs- Replace sinks, benchtops, plumbing fixtures, accessories, lab casework, fume hood side closure panels and paint walls. Flooring asbestos remediation.
- C. Related Sections include the following:
 - 1. Section 11 53 33, "Laboratory Safety Equipment".
 - 2. Section 11 53 43, " Laboratory Service Fittings and Fixtures".
 - 3. Section 12 35 53.13 "Painted Metal Laboratory Casework".

1.3 PERFORMANCE REQUIREMENTS

- D. Seismic Performance: Provide assemblies and systems capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures", Section 9, "Earthquake Loads", whichever is more stringent.

1.4 SUBMITTALS

- A. Product Data: Submit product data for manufactured items.
- B. Samples: Submit samples of the following:
 - 1. Benchtop materials.
 - 2. Painted metal finishes.
- C. Shop Drawings: Submit shop drawings for laboratory accessory assemblies that are factory and/or field assembled from manufactured components. Submit shop drawings showing locations, materials, connections and all details of construction and installation.
 - 1. Benchtops showing joint locations and fixture holes and cut outs.
 - 2. Glassware drying pegboard racks.
 - 3. Service drops.
 - 4. Fume extractors and supports.
- D. Product Test Reports: Based on tests performed by a qualified independent testing agency, indicate compliance with SEFA 3 and 8 for laboratory casework finishes and countertops with requirements specified for chemical and physical resistance.
- E. Qualification Data: Firms and/or persons specified shall 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. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
- G. All products must be manufactured or substantially transformed in the United States or TAA designated country. Documentation to be provided with first submittal.
 - 1. USA Certificate of Origin: Manufacturer shall supply with first submittal, an example of their Certificate of Origin declaring products are wholly manufactured and assembled specifically in the United States, including city and state locations. A notarized Certificate of Origin shall be provided with closeout documents.

1.5 QUALITY ASSURANCE

- A. Coordinate the interface of the laboratory accessories with the laboratory casework. Verify and coordinate all requirements for cutouts, attachments, reinforcing, piping, electrical devices, sizes and locations with laboratory casework and other laboratory items.
- B. Manufacturer shall identify and designate a full-time factory representative for on-site supervision and coordination during the installation of laboratory casework and laboratory accessories.
- C. Single Source Responsibility: Laboratory casework manufacturer shall provide and install all laboratory accessories in order to maintain single source responsibility for laboratory fit-up items.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver laboratory accessories until painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate materials or assemblies have been completed in installation areas. If items must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions" Article below.
- B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install laboratory accessories until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels through remainder of construction period.

1.8 COORDINATION

- A. Coordinate layout and installation of metal framing and reinforcement in gypsum board assemblies for support of laboratory accessories.

1.9 EXTRA MATERIALS

- A. Furnish complete touchup kit for each type and color of laboratory accessory provided. Include fillers, primers, paints, fabric patches, and other materials necessary to perform permanent repairs to damaged items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, other manufacturers offering products may be incorporated into the Work subject to approval by laboratory architect.

2.2 MATERIALS

- A. Unless specified otherwise under an individual laboratory accessory, provide the following materials.
 - 1. Metal: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 366 (ASTM A 366M); matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness. Minimum 18 ga.

2. Stainless Steel: AISI Type 304 with No. 4 satin finish unless otherwise indicated.
3. Chemical-Resistant Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, chemical-resistant, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and 2 mils (0.05 mm) for system.

2.3 FABRICATION

A. Laboratory Benchtops, General:

1. Provide and install type and configuration of laboratory benchtops as indicated on drawings.
2. Fabricate benchtops in as large components as practicable to minimize field jointing.
3. Provide separate box curbs and splash trims with benchtops.
4. Field Jointing: Where possible, make in the same manner as shop jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project site processing of top and edge surfaces is not required. Locate field joints where shown on approved Shop Drawings.
5. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection. Provide flush hairline joints in tops using clamping devices.
 - a. Where necessary to penetrate tops with fasteners, countersink heads approximately 1/8 inch (3 mm) and plug hole flush with material equal to top in chemical resistance, hardness, and appearance.
6. Provide required holes and cutouts for service fittings.
7. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
8. Provide scribe moldings for closures at junctures of top, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

2.4 (P) PHENOLIC RESIN BENCHTOP

- ### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fundermax Lab Work Surfaces
 2. Trespa Toplab and Toplab PLUS

2.5 (LS-#) LABORATORY SINKS

- A. Laboratory Sinks: Provide and install laboratory sinks in materials and sizes as indicated on laboratory equipment drawings. Provide sizes as indicated or manufacturers' closest stock size of equal or greater volume. Provide all sinks complete with strainers, tail pieces, traps, stops and escutcheons.
 - 1. Provide ¼" high marine edge around cup sinks in fume hoods for spill containment.
- B. Outlets: 1-1/2" diameter, manufacturer's standard length, fabricated of silicon iron, cast epoxy resin, stainless steel, glass, or lead; of same material as sink wherever possible, or as otherwise acceptable to laboratory architect.
- C. Overflows: For each sink, except cup sinks, provide overflow of standard beehive or open top design and with separate strainer. Height 2" less than sink depth. Provide in same material as sink.
- D. Material:
 - 1. Cast Epoxy Resin Sinks: Non-glare molded in one piece with surfaces smooth, corners, coved and bottom sloped to outlet. Minimum physical properties, chemical resistance and color as specified for cast epoxy resin tops. Thickness, ½" minimum.
- E. Installation of Sinks:
 - 1. Underside Installation for Epoxy Resin Sinks: Use manufacturer's recommended adjustable support system for table- and cabinet-type installations.
 - 2. Set top edge of sink unit in manufacturer's recommended chemical-resistant sealing compound and firmly secure to underside of benchtop to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement.
 - 3. Flush Drop-in Installation for Epoxy Resin and Plastic Cupsinks: Rout groove in top to receive sink rim if not prepared in shop. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and top manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.
 - 4. Semiflush Installation Self-Rimming Stainless Steel and Plastic Sinks: Use stainless-steel sink frame, complete with clamping lugs and pads. Before setting, apply a full coat of sink and top manufacturer's recommended sealant under rim lip and along top. Omit sink frame if sink is fabricated with an integral rim seal.

2.6 (PB-#) PEGBOARD GLASS DRYING RACKS

- A. Provide and install Glass Drying Racks as described here and as indicated on drawings. Unless otherwise indicated on drawings the size shall be:
 - 24" W x 24" H.
- B. Glass drying rack assemblies shall include the following components:

1. Front Panel: 1" thick epoxy resin or 1" stainless steel with No. 4 finish.
2. Glassware Pegs: Replaceable stainless steel or solid black polypropylene with glassware protector bases.
3. Drip Trough: Stainless steel drip trough with PVC drainage hose.
4. Finished Back Panels: Matching finish and material at front panel.
5. Provide all fittings, fasteners, bracing, brackets, etc., for installation illustrated on drawings. Coordinate all reinforcing requirements for wall, frame or service drop mounting. Identify mounting method on shop drawings.

2.7 (SC-#) SERVICE CHASES

- A. Fabrication: Fabricate and install painted sheet metal service chases in configurations as detailed on drawings consisting of removable and fixed panels.
 1. Removable and fixed service chase panels are to fit together flush showing a minimum joint where they join.
 2. Removable access panels are to have concealed-to-view pins, catches, clips, strikes, etc., that allow removal of panel with an upward motion.
 3. Fabricate and install service chase 1" lower than the bottom of light fixture line or ceiling if applicable to facilitate removal of access panel in an upward motion.
 4. All panels are to interlock with benchtop backsplashes so as the face of the backsplash and service chase panel are flush, unless otherwise detailed on laboratory equipment drawings.
 5. Fixed service chase panels shall be fastened to the wall or support unistrut -- whichever is applicable. Fixed panels shall be fitted with internal horizontal unistrut spaced vertically at 24 in on center to facilitate the internal fastening and support of mechanical piping and ductwork.
 6. Welds shall be continuous, ground smooth, and finished to match adjacent surfaces.
- B. Finish: Service chase shall be shop prime painted with corrosion resisting primer and receive shop finish coating. Provide color as listed in the Laboratory Component Finish Schedule on the drawings.
- C. Installation: Install service chases plumb, level and true.

2.8 (TL-1) MAGNETIC TASK LIGHT

- A. The design standard for this project is the Reed Premier fixture by Light Corp.
 1. Quantity of (10) magnetic movable task lights.
 2. Size: 17", 24", 31", 44" or 58"
 3. Finish: Silver with White endcaps

4. Cord Color: White
5. Mounting: Screw or Magnetic
6. Model to feature 9-ft cord and standard 120V plug. (no transformer).
7. Locations: Not determined, provide to owner for use as needed.
8. Automatic turn off.

2.9 (CR-1) GAS CYLINDER RESTRAINT RACKS AND STRAPS

- A. Cylinder Restraint Manufacturer: The design standard for cylinder restraints with straps and buckles are:
 1. McMaster Carr, Cylinder Holder, Type "F" Steel with 1 1/2" Wide Polypropylene Strap.
 - a. Provide model# 2283T72, 2283T17 or 2283T18 for 2, 3 or 4 cylinders respectively as indicated on laboratory equipment plans.
 2. Finish: Racks shall be manufacturer's standard finish.
- B. Installation: Install cylinder restraint racks plumb, level and square to walls unless otherwise indicated on drawings. Brace rack assemblies to walls to prevent sway. Fabricate and install with all components for a complete assembly.

2.10 (US-#) UNISTRUT SUPPORT FRAMING

- A. Provide, fabricate and install metal, FRP and stainless steel Unistrut framing as detailed and indicated on drawings.
- B. The following lists Unistrut framing integral with the installation of laboratory casework, fume hoods, service fittings and accessories.
 1. Overhead service carriers.
 2. Pipe and service drop supports.
 3. Gas cylinder storage racks.
 4. Shelving standards.
 5. Suspended equipment supports.
 6. Exhaust snorkel support framing.
 7. Miscellaneous structures and supports as detailed on drawings.
 8. Suspended structural ceiling grids for equipment and lighting support.
- C. Provide unistrut framing as indicated, complete with all nuts, bolts, fittings, and accessories as required.
- D. Exposed Metal unistrut framing shall be shop prime painted with corrosion resisting primer and receive a shop finish coating. Provide color as listed in the Laboratory Component Finish Schedule on the drawings.
- E. Non-exposed: All metal unistrut framing located above a drop ceiling which will not be visible to room occupants shall be finished with manufacturer's standard finish.
- F. Provide Owner with 12 copies of current parts catalog and price guide.
- G. Install unistrut framing prior to the installation of any ductwork, conduit and piping.

- H. Install unistrut framing plumb, level and true. Secure framing to structure and walls with fasteners, appropriate for the intended use. Provide engineering data and locations of all fasteners used.

2.11 (LC-2) LAB COAT HOOKS

- A. Manufacturer: The design standard for the lab coat hooks is Glaro Coat Hooks, solid rustproof aluminum construction model #ALS-SA".
- B. Finish: Hooks shall be manufacturer's standard satin aluminum finish.
- C. Installation: Install coat hooks plumb, level and square to walls unless otherwise indicated on drawings. Brace rack assemblies to walls to prevent sway. Fabricate and install with all components for a complete assembly.

2.12 CONCEALED STEEL BRACKETS

- A. Material: Steel
 - 1. Finish: Powder Coated Black
- B. Design: Front Mounting Plus Countertop Support.
- C. Loads: Up to 400 lbs. per bracket, evenly distributed
- D. Thickness: 3/16 inch x 2 inch, A-36 steel
- E. Edges: rounded for safety
- F. Manufacturers: Steel Design Solutions and Centerline Brackets

PART 3 - EXECUTION

3.1 INSTALLATION AND CLEANING

- A. Install accessories according to approved Shop Drawings and manufacturer's written instructions.
- B. General: Install all items plumb, level, properly aligned, rigid, and securely anchored to building and casework components.
- C. Repair, remove or replace defective work as directed on completion of installation.
- D. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF LABORATORY ACCESSORIES

(LC-2) LABORATORY COAT HOOKS



To Place Your Order by Phone, Call:
1-832-476-4560



**Glaro Coat Trees and
Glaro Coat Hooks
Rugged All Aluminum
Coat Hanging Products**

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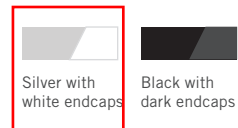
Glaro-Products.Com



REED PREMIER

Available in five lengths, in either standard or high output and with interlinking capabilities, Reed Premier creates customized lighting solutions for any space. Designed to attach directly beneath underbin cabinetry, its slim profile mounts effortlessly to provide superb quality illumination exactly where it's needed. Its multiple energy-saving components include an automatic shut-off feature, optional occupancy or vacancy sensor and a capacitive touch dimming feature with last state memory that allows the user to tailor its intensity to any specific task with ease. **Proudly designed and manufactured in Grand Haven, Michigan.**

Finishes



REED PREMIER

Features

- Choose from standard or high output
- Interlinkable
- Automatic shut-off after 10 hours (± 15 mins.)
- Continuous dimming from 100%–15% with last state memory
- Optional occupancy or vacancy sensor available as a modular accessory or integrated into the fixture

Specifications

Lengths:	17", 24", 31", 44", 58"
Power consumption:	see chart below
Color temperature:	3500K; 4000K available on request
Luminosity:	see chart below
Color rendering index:	83+ CRI
Rated lifespan:	> 50,000 hours
Number of LEDs:	see chart below
Power supply:	9' (18W) or 11' (65W); choose from black or white cord

Provide cord with plug only, no adapter box.

	# of LEDs SO/HO	Lumens SO/HO	Wattage SO/HO	System SO/HO
17"	24/47	430/755	8.0/13.0	9.1/14.6
24"	36/70	708/1217	12.4/20.4	14.1/23.7
31"	48/94	916/1394	16.4/26.4	17.6/28.4
44"	72/141	1293/2080	24.2/38.8	25.9/41.4
58"	96/188	1751/2920	31.2/50.0	33.7/54.0

Sustainability Notes

- Made with fully-recyclable anodized aluminum and plastic
- Energy-saving features such as auto shut-off and dimming included; occupancy/vacancy sensors available
- Lower power consumption
- Mercury-free
- Potential LEED points: **Interior Lighting** (possible 2 points), **Interior Lighting Controls** (possible 1 point). For more LEED information please visit <https://new.usgbc.org/leed-v41>



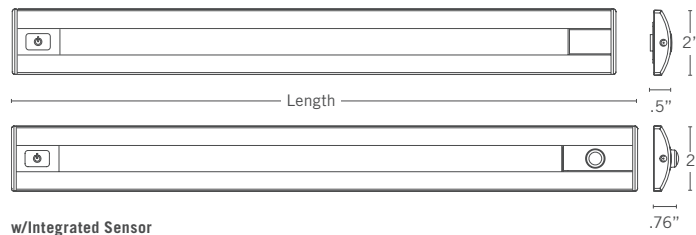
Certifications

ETL listed: compliant to UL 153/8750 & CSA C22.2 No. 9; FCC Part 15 Class B; TAA; BAA; CEC Title 20, NYC #10A0477

Warranty

The Reed Premier fixture is warranted for a period of 10 years. Reed Premier power supplies are warranted for 5 years.

Dimensions



	Actual Length	Actual Length w/Integrated Sensor	Suggested Shelf Size
17"	16.4"	17.2"	24"–36"
24"	23.3"	24.1"	30"–42"
31"	30.1"	30.9"	42"–48"
44"	43.7"	44.5"	54"–60"
58"	57.4"	58.2"	≥ 72"

REED PREMIER

Photometric Data

Footcandle outputs measured at 18" from the work surface.

17" Standard Output	18"	12"	6"	CL	6"	12"	18"
12"	10	18	27	31	27	18	11
6"	15	30	49	59	49	30	15
CL	18	38	64	79	65	38	19
6"	16	32	54	65	64	33	17
12"	12	21	31	37	31	21	12

17" High Output	18"	12"	6"	CL	6"	12"	18"
12"	17	30	44	51	44	30	18
6"	26	50	82	97	81	51	26
CL	31	63	109	132	109	65	32
6"	28	56	90	108	91	55	29
12"	20	36	53	59	53	36	21

24" Standard Output	18"	12"	6"	CL	6"	12"	18"
12"	18	29	39	43	39	28	17
6"	27	49	71	80	70	48	26
CL	33	63	95	106	92	60	32
6"	30	54	80	89	78	53	29
12"	21	34	47	52	47	33	20

24" High Output	18"	12"	6"	CL	6"	12"	18"
12"	28	45	61	67	60	44	27
6"	43	78	113	127	111	76	42
CL	53	101	152	171	150	99	52
6"	48	87	127	144	126	86	46
12"	33	55	75	83	74	54	33

31" Standard Output	18"	12"	6"	CL	6"	12"	18"
12"	25	38	49	53	50	39	26
6"	41	67	88	95	87	67	42
CL	50	86	114	125	115	87	52
6"	43	73	96	104	97	74	45
12"	29	45	57	62	58	46	30

31" High Output	18"	12"	6"	CL	6"	12"	18"
12"	40	61	78	85	79	62	42
6"	64	106	140	152	141	108	67
CL	80	137	183	200	186	141	84
6"	70	116	154	168	156	119	73
12"	47	72	92	99	93	73	49

44" Standard Output	18"	12"	6"	CL	6"	12"	18"
12"	42	54	61	63	61	54	42
6"	73	95	106	109	104	93	72
CL	94	124	138	141	137	122	94
6"	80	105	117	121	117	104	80
12"	50	64	72	75	72	64	50

44" High Output	18"	12"	6"	CL	6"	12"	18"
12"	69	88	100	104	100	89	71
6"	118	155	174	180	174	154	120
CL	151	199	224	232	225	202	155
6"	127	167	188	194	189	168	131
12"	79	102	115	120	115	103	81

58" Standard Output	18"	12"	6"	CL	6"	12"	18"
12"	58	65	68	69	68	64	57
6"	101	113	117	118	116	110	98
CL	131	144	150	151	149	143	128
6"	109	122	127	129	127	121	108
12"	67	75	79	80	79	75	67

58" High Output	18"	12"	6"	CL	6"	12"	18"
12"	93	104	110	110	111	104	95
6"	160	179	187	189	187	178	162
CL	205	228	238	240	239	229	207
6"	172	192	202	204	203	194	176
12"	104	120	126	129	127	121	108

(CR-1) CYLINDER RESTRAINT

Wall Mount



E



F



G



H

Wall mount holders attach to any wall; fasteners are not included. The base of **style H** must rest on the floor in addition to being secured to the wall.

	Holds No. of Cylinders	Cylinder Dia. Range	Overall Size			Mounting Holes		Each
			Wd.	Ht.	Dp.	No.	Dia.	
Steel with Steel Chain—Zinc-Plated Finish								
E	1	7"-9"	10 1/2"	1 1/4"	3"	2	3/8"	2283T1* \$14.67
E	1	9"-16"	19 1/2"	1 1/4"	6"	2	3/8"	2283T3* 21.58
E	2	9 1/4"-12 7/8"	23"	3"	6"	3	5/8"	2283T7†° 70.68
Steel with 1 1/2" Wide Polypropylene Strap—Light Gray								
F	1	4"-12"	8"	4 1/4"	2 1/4"	2	13/32"	2283T22 26.12
F	2	4"-12"	24"	4 1/4"	2 1/4"	4	13/32"	2283T72 52.96
F	3	4"-12"	36"	4 1/4"	2 1/4"	4	3/8"	2283T17 72.60
F	4	4"-12"	48"	4 1/4"	2 1/4"	8	3/8"	2283T18 99.64

* Made of 3/32" thick steel channel.

† Made of 3/16" thick steel channel. Color is green.

° One side holds a cylinder up to 9 1/4" dia.; the other side holds a cylinder up to 12 7/8" dia.

	Holds No. of Cylinders	Cylinder Dia. Range	Overall Size			Mounting Holes		Each
			Wd.	Ht.	Dp.	No.	Dia.	
Type 304 Stainless Steel with 1 1/2" Wide Polypropylene Strap								
F	1	4"-12"	8"	4 1/4"	2 1/4"	2	13/32"	2283T61 \$57.70
F	2	4"-12"	24"	4 1/4"	2 1/4"	4	13/32"	2283T63 108.90
Polypropylene with 1 1/2" Wide Polypropylene Strap and Steel Chain—Red								
G	1	4"-14"	9"	4"	2"	2	5/16"	2283T11 24.49
G	2	4"-12"	24"	4 1/2"	2"	4	5/16"	2283T67 53.54
Polyethylene with 1" Wide Nylon Strap—Yellow								
H	2	3"-12 3/8"	28"	30"	14"	4	3/4"	2283T95 146.55



STAINLESS STEEL PEGBOARDS

INTER DYNE SYSTEMS MOD-RACK™ PEGBOARDS

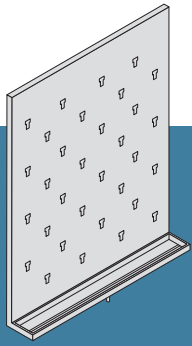
At Inter Dyne Systems we believe that an organized workstation functions better and helps you to operate more efficiently. That's why we've developed a full line of versatile workstation solutions, including our Mod-Rack™ pegboards. Mod-Rack pegboards serve a dual purpose in a modern laboratory. First, they allow you to quickly dry important, and often fragile, equipment in a sanitary manner. Second, our well-crafted pegboards are a safe place to store often used materials so they are readily at-hand when you need them. Mod-Rack pegboards come in a wide variety of sizes and mounting options and our selection of accessories allow you to completely customize your workstation. Custom sizes are available at a not so custom price and are furnished in a timely manner.



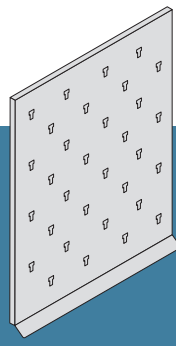
**INTER DYNE SYSTEMS:
VERSATILE WORK STATION SOLUTIONS**

Inter Dyne Systems began over 25 years ago as an innovator of modular laboratory equipment by fabricating and selling stainless steel pegboards.

Over time we gained a reputation as the leader in the laboratory pegboard market. We've built upon that foundation by continuing to offer high quality pegboards with dependable service, consistent quality and on time delivery. We also offer shelving components, narcotics storage cabinets, countertops and innovative acrylic products.



**"V" VICTORIA
STYLE**



**"B" BARON
STYLE**

**MOD-RACK™ PEGBOARDS:
VICTORIA AND BARON STYLE**

The Victoria or "V" pegboard is constructed of lightweight stainless steel, offered in a range of sizes and variety of mounting options. Along the bottom is a drip trough that funnels water away to a drain, allowing equipment to dry quickly and remain sanitized. Each "V" style pegboard includes an integral drip trough, wall bracket, standard 6" white pegs and 3 ft. of clear plastic drain hose.

The "B" Baron is also made of lightweight stainless steel. It is offered in three sizes and a variety of mounting options. A drip deflector at the bottom diverts water away from walls and directs it to a sink or drain. Each "B" style pegboard includes a wall bracket and standard 6" white pegs.

"V" VICTORIA STYLE PEGBOARDS



MODEL NO.	SIZE WxH	NO. OF PEGS	SHIPPING WT.
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V1824	18" x 24"	15	13 lbs.
V2418	24" x 18"	16	13 lbs.
V2424	24" x 24"	20	16 lbs.
V2430	24" x 30"	32	23 lbs.
V2436	24" x 36"	40	25 lbs.
V3024	30" x 24"	25	23 lbs.
V3030	30" x 30"	50	24 lbs.
V3036	30" x 36"	40	23 lbs.
V3624	36" x 24"	30	25 lbs.
V3630	36" x 30"	60	23 lbs.
V3636	36" x 36"	66	25 lbs.
V4824	48" x 24"	40	24 lbs.
V4830	48" x 30"	48	28 lbs.
V4836	48" x 36"	88	31 lbs.

"B" BARON STYLE PEGBOARDS



MODEL NO.	SIZE WxH	NO. OF PEGS	SHIPPING WT.
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B2430	24" x 30"	32	14 lbs.
B3030	30" x 30"	50	17 lbs.
B3630	36" x 30"	50	21 lbs.

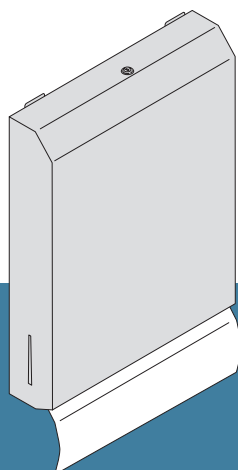


PEGBOARDS CAN BE WORKSTATIONS

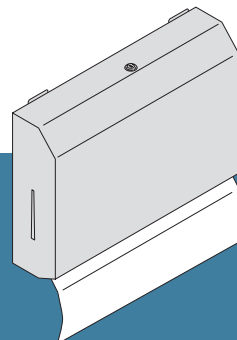
The addition of our accessories such as drain shelves, cylinder yolks and drain baskets can change a simple pegboard into a customized and efficient workstation. We offer a variety of accessories and peg options, so no matter where you are working or what you are working with, you can get what you need right away.

ACCESSORIES

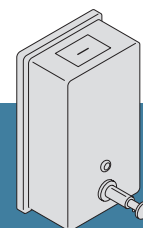
All of our accessories are made of the same high quality stainless steel as our pegboards. They come with a 5 year guarantee, can be sterilized by an autoclave and will easily help transform your Mod-Rack™ pegboard into your own customized workstation.



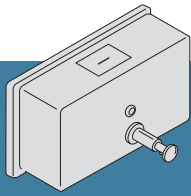
0210 Paper Towel
Holds up to 400 c-fold or 535 multi fold paper towels, 11" x 14.5" x 4".



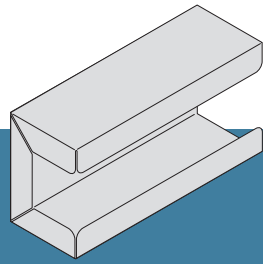
0215 Paper Towel
Holds up to 150 c-fold or multi fold paper towels, 11" x 8" x 4".



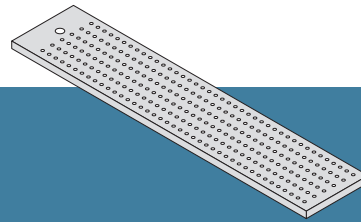
0343 Soap Dispenser
Holds up to 40 fl. oz. of liquid 4.75" x 8.5" x 3" Comes with pegboard & wall mount clips.



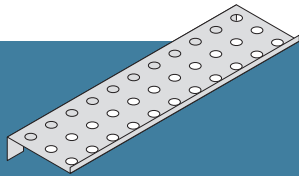
0342 Soap Dispenser
Holds up to 40 fl. oz. of liquid, 8.5" x 4.75" x 3". Comes with pegboard & wall mount clips.



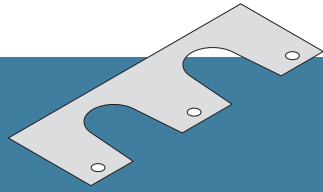
GD-10 Glove Dispenser
Holds most standard glove boxes.



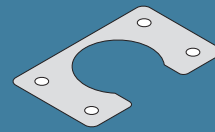
DG-2 & DG-4 Drain Grid
To accommodate smaller tools and equipment. 2" or 4" wide drain grid for drip trough.



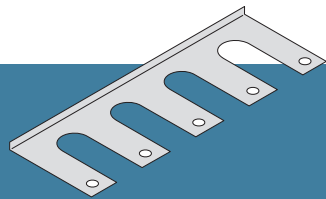
DS-12 Drain Shelf
12" shelf for drying small tools, cylinders and equipment. Shipped with required support pegs for installation.



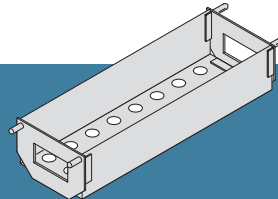
CY-12 Cylinder Yolk
12" yolk holds large cylinders or flasks. Shipped with required support pegs for installation.



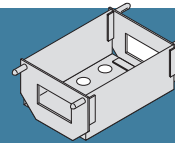
FH-6 Flask Holder
6" holder for drying Erlenmeyer flasks or large cylinders. Shipped with required support pegs for installation.



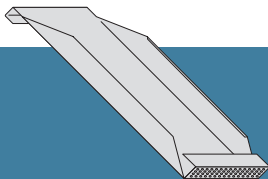
FR-12 Funnel Rack
12" rack holds up to four cylinders. Shipped with required support pegs for installation.



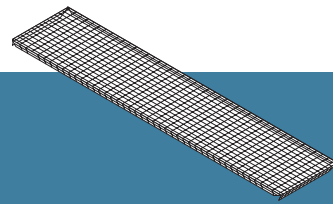
DB-12 Drain Basket
12" basket for drying smaller tools, cylinders and equipment. Shipped with required support pegs for installation.



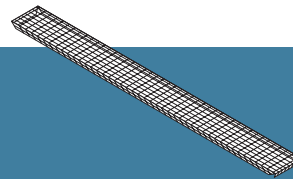
DB-6 Drain Basket
6" basket for drying smaller tools, cylinders and equipment. Shipped with required support pegs for installation.



PR-12 Pipette Rack
12" shelf for drying glass or bulbous pipettes. Shipped with required support pegs for installation.

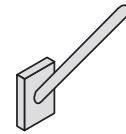


SI-4 Screen Insert
4" wide screen insert for drip troughs.

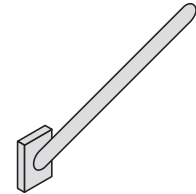


SI-2 Screen Insert
2" wide screen insert for drip troughs.

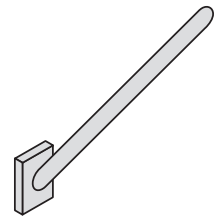
PEG OPTIONS



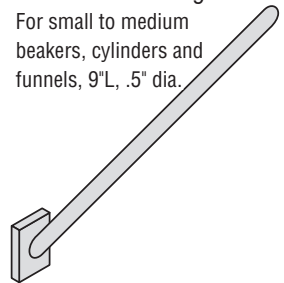
TP-4 Tube Peg
Perfect for smaller beakers, cylinders and funnels, 4"L, .25" dia.



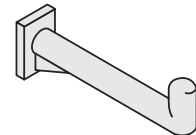
BP-6 Tube Peg
Perfect for smaller beakers, cylinders and funnels, 6"L, .5" dia.



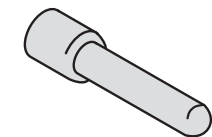
LP-9 Medium Peg
For small to medium beakers, cylinders and funnels, 9"L, .5" dia.



LP-12 Long Peg
Can accommodate medium to large beakers, cylinders and funnels, 12"L, .5" dia.



SP-4 Support Peg
Used for mounting racks, shelves and baskets, 4"L.



PE-3 Peg Extender
Lengthen all pegs an additional 3 inches.



HP-1 Peg Hole Cover
Seals unused peg holes.



ACCESSORY PACKAGES

To easily help customize your Mod-Rack™ pegboard, we've created functional package options that include some of our most popular accessories.



0210 Paper Towel Dispenser



0215 Paper Towel Dispenser



0343 Soap Dispenser



0342 Soap Dispenser



GD-10 Glove Dispenser



DB-12 Drain Basket



DB-6 Drain Basket



DG-2 or DG-4
Drain Grid



DS-12 Drain Shelf



FH-6 Flask Holder



FR-12 Funnel Rack



CY-12 Cylinder Holder



PR-12 Pipette Rack



SI-4 Screen Insert

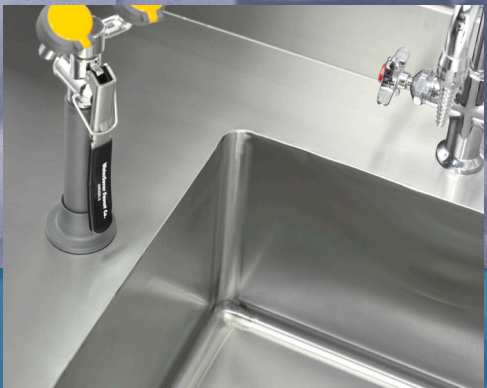
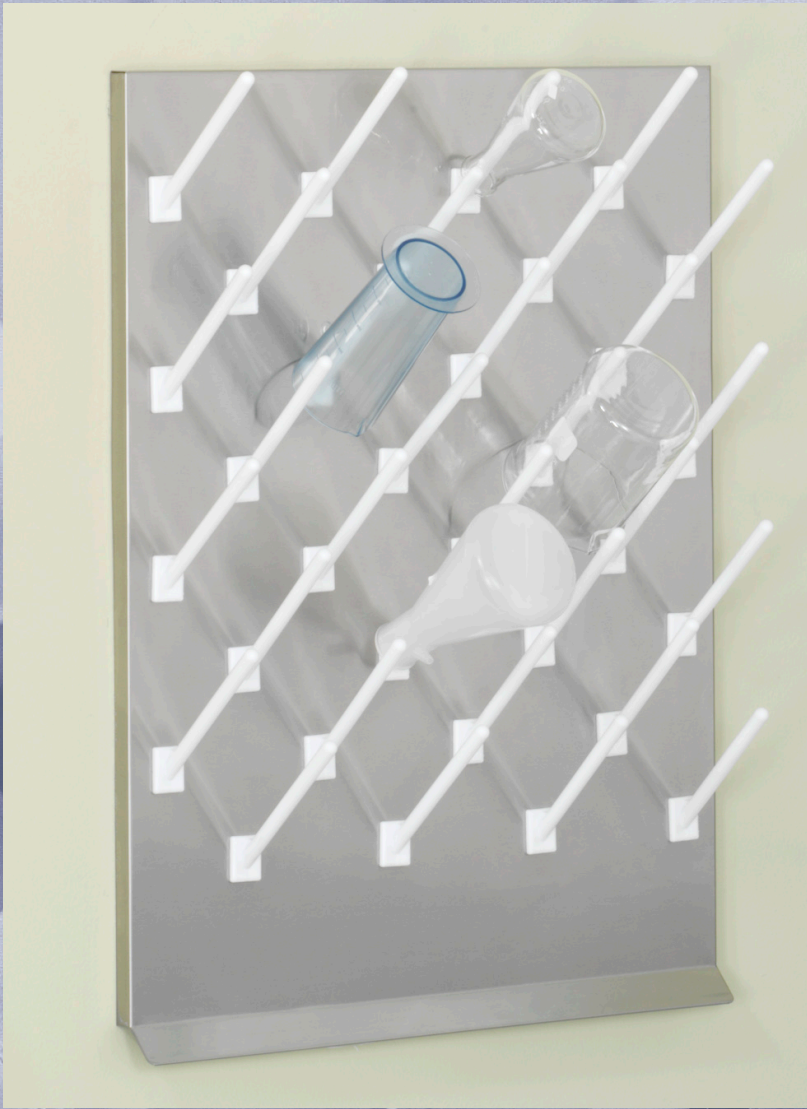


SI-2 Screen Insert

MODEL NO.	SIZE WxH	NUMBER PEGS	COMPLETE WITH
V1824/PKG	18"x24"	15	
V2418/PKG	24"x18"	16	
V2424/PKG	24"x24"	20	
V2430/PKG	24"x30"	32	
V2436/PKG	24"x36"	40	
V3024/PKG	30"x24"	25	
V3030/PKG	30"x30"	50	
V3036/PKG	30"x36"	40	
V3624/PKG	36"x24"	30	
V3630/PKG	36"x30"	60	
V3636/PKG	36"x36"	66	
V4824/PKG	48"x24"	40	
V4830/PKG	48"x30"	48	
V4836/PKG	48"x36"	88	

PEGBOARDS ARE ONLY THE BEGINNING

At Inter Dyne, pegboards and accessories are only the beginning of the quality laboratory equipment we offer. We also offer a wide variety of stainless steel shelving components, narcotics storage cabinets and countertops; as well as acrylic and epoxy pegboards.



Our stainless steel countertops can be ordered to size with or without back/side splashes and integral sinks.



We have narcotics cabinets and specimen pass-through boxes in a variety of size, locking and mounting options.



Convenient and safe storage is a necessity in any lab. Our shelves and shelving components put everything you need right at your finger tips.

PEGBOARD MOUNTING OPTIONS



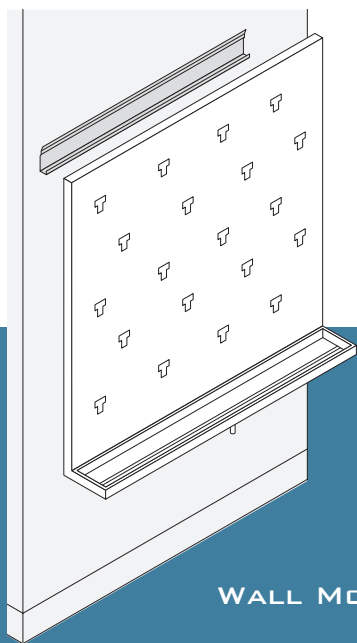
Wall Mount

All Mod-Rack Pegboards are shipped complete with our standard wall bracket that is clearly labeled for easy installation. All 4" trough pegboards also come with a stabilizer bracket that attaches to the wall at the bottom of the pegboard and slips over the drain spout; keeping the pegboard secure against the wall.

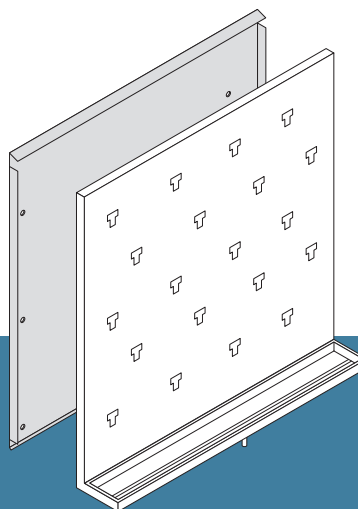


Finished Back

In today's ever evolving lab environments wall space is not always available. Islands have become a mainstream design character in labs and can make installing pegboards slightly more challenging. However, by adding a finished back panel to your pegboard it will easily install to any utility chase, or reagent shelf system.



WALL MOUNT

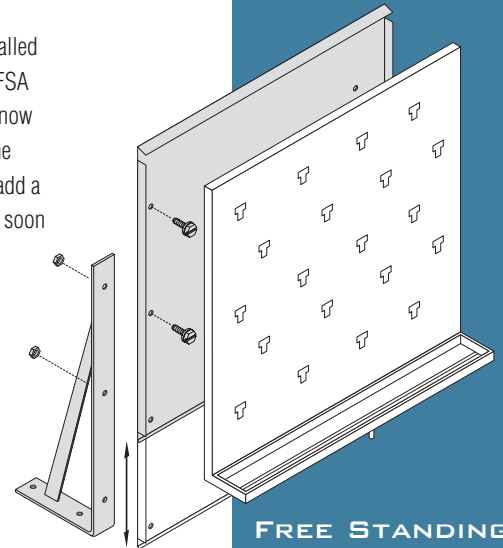


FINISHED BACK



Free Standing Assembly Brackets

If space becomes limited any Mod-Rack can be installed to a laboratory work surface. By simply adding our FSA brackets that are 23" tall x 7.5" at the base, the unit now becomes free standing. They are supplied with all the necessary hardware for attaching to a counter. Just add a finished back panel to the pegboard for support and soon your countertop becomes a workstation.

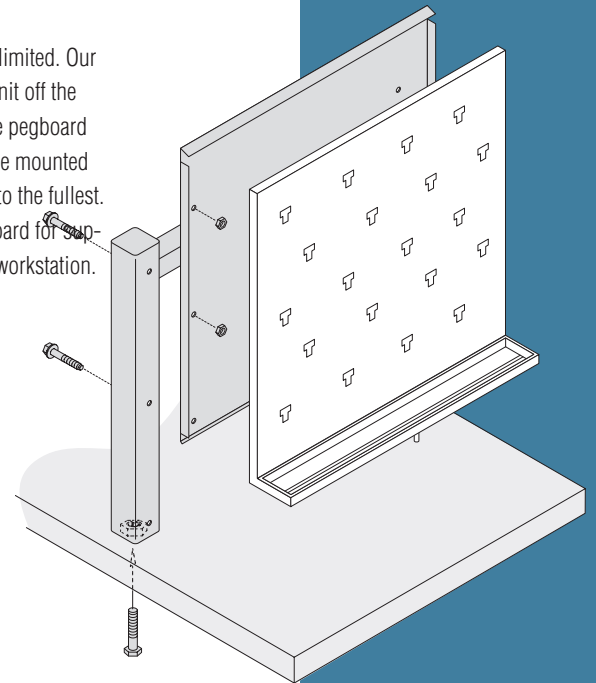


FREE STANDING ASSEMBLY

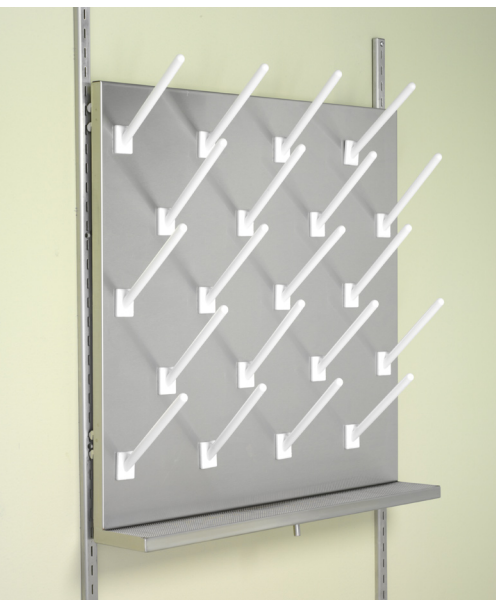


Raised Top Assembly

If wall, utility chase or countertop space is limited. Our raised top assembly allows you to lift the unit off the work surface as far as 12". Space below the pegboard is free and, if desired, two pegboards can be mounted back to back – maximizing your lab space to the fullest. Just add a finished back panel to the pegboard for support and soon your countertop becomes a workstation.

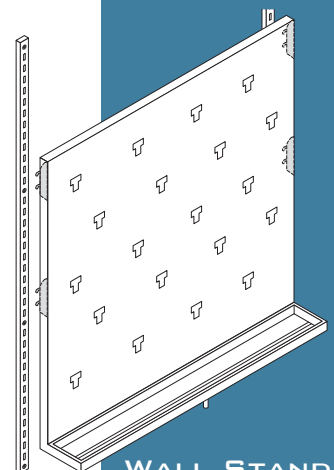


RAISED TOP ASSEMBLY



Wall Standard Mount

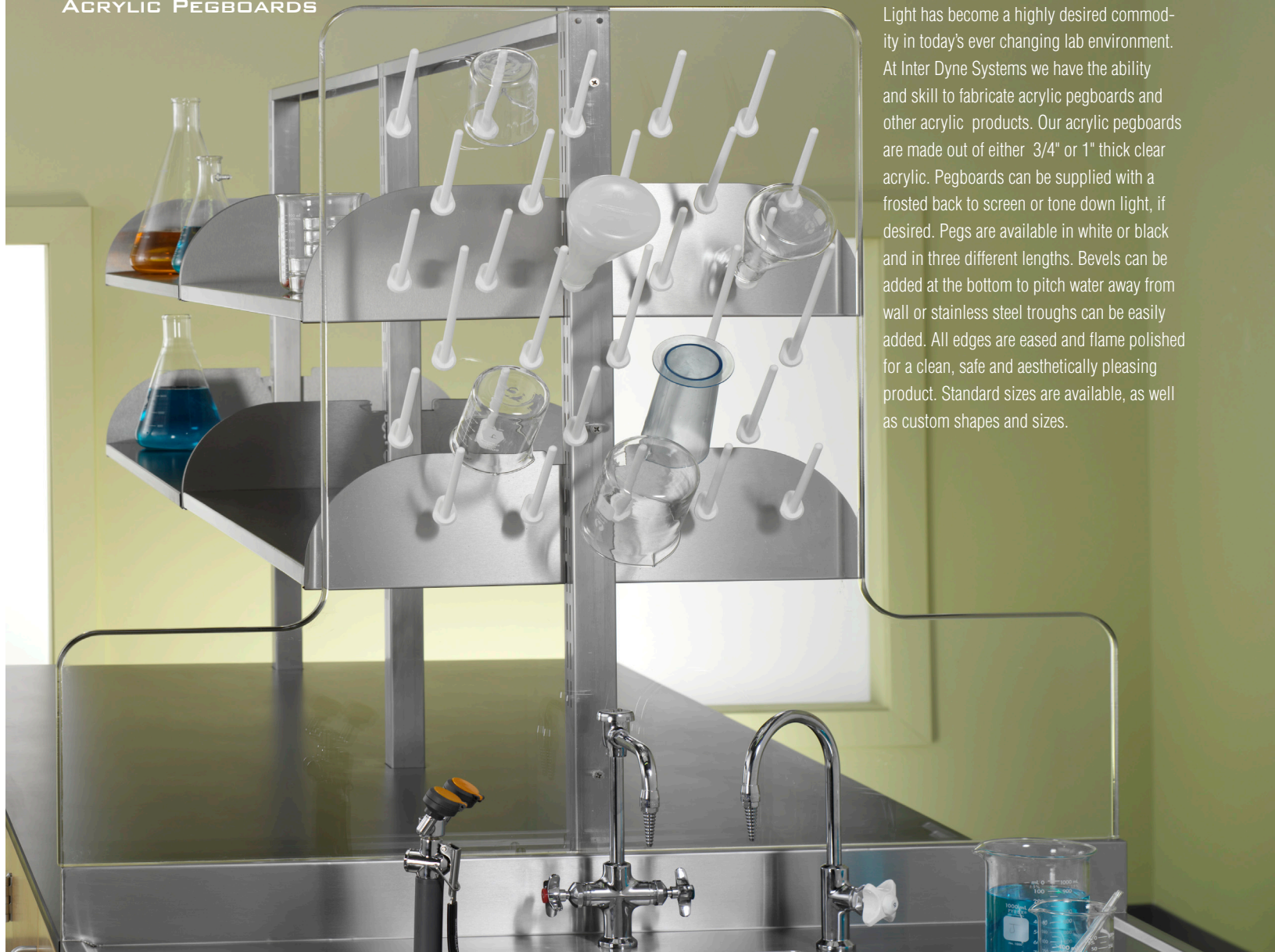
Mod-Racks can be mounted so they are fully adjustable, allowing you to raise or lower the unit to your desired height. The addition of an integral clip system to the back of the pegboard makes adjustment simple and any workstation that much more versatile. Just lift and clip it to the wall and now your pegboard is positioned at the height best for you. When ordering please add the suffix "AHB" to the pegboard product number and remember to order standards also.



WALL STANDARD MOUNT



ACRYLIC PEGBOARDS



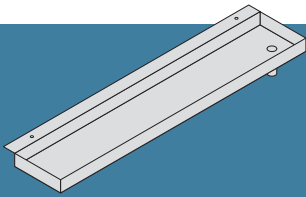
Light has become a highly desired commodity in today's ever changing lab environment. At Inter Dyne Systems we have the ability and skill to fabricate acrylic pegboards and other acrylic products. Our acrylic pegboards are made out of either 3/4" or 1" thick clear acrylic. Pegboards can be supplied with a frosted back to screen or tone down light, if desired. Pegs are available in white or black and in three different lengths. Bevels can be added at the bottom to pitch water away from wall or stainless steel troughs can be easily added. All edges are eased and flame polished for a clean, safe and aesthetically pleasing product. Standard sizes are available, as well as custom shapes and sizes.

EPOXY PEGBOARDS

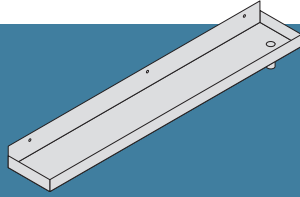
At Inter Dyne Systems we understand how time can be of the essence for many lab dealers or end users. With this issue in mind we stock various standard sized epoxy pegboards that can be shipped quickly for immediate resolve. A stainless steel drip trough can be easily mounted to the bottom edge. Epoxy pegboards are black 1" thick and available with white or black pegs in a variety of lengths.



DRIP TROUGHS AND ACCESSORY OPTIONS



PEGBOARD MOUNT



FACE MOUNT

Stainless steel drip troughs can be mounted to the bottom of any acrylic or epoxy pegboard. All troughs come with three feet of clear PVC tubing and pre-drilled holes for easy installation. You can select a stainless steel screen insert or drain grid to create an additional shelf-like surface for drying. All sizes are stocked and ready for immediate shipping.

Stainless steel face-mount drip troughs are designed for use with any pegboard. Troughs come complete with three feet of clear PVC tubing and pre-drilled holes for easy installation. Face-mount drip troughs can be ordered with a screen insert or drain grid to add additional drying or storage space. They are manufactured from high-quality stainless steel and are stocked for immediate shipment.

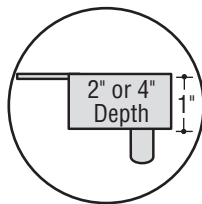
PEGBOARD MOUNT



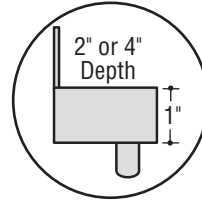
FACE MOUNT



PEGBOARD MOUNT	FACE MOUNT	SCREEN INSERT	DRAIN GRID
HDT-18-2	FDT-18-2	SI-18-2	DG-18-2
HDT-18-4	FDT-18-4	SI-18-4	DG-18-4
HDT-20-2	FDT-20-2	SI-20-2	DG-20-2
HDT-20-4	FDT-20-4	SI-20-4	DG-20-4
HDT-24-2	FDT-24-2	SI-24-2	DG-24-2
HDT-24-4	FDT-24-4	SI-24-4	DG-24-4
HDT-30-2	FDT-30-2	SI-30-2	DG-30-2
HDT-30-4	FDT-30-4	SI-30-4	DG-30-4
HDT-32-2	FDT-32-2	SI-32-2	DG-32-2
HDT-32-4	FDT-32-4	SI-32-4	DG-32-4
HDT-36-2	FDT-36-2	SI-36-2	DG-36-2
HDT-36-4	FDT-36-4	SI-36-4	DG-36-4
HDT-42-2	FDT-42-2	SI-42-2	DG-42-2
HDT-42-4	FDT-42-4	SI-42-4	DG-42-4
HDT-48-2	FDT-48-2	SI-48-2	DG-48-2
HDT-48-4	FDT-48-4	SI-48-4	DG-48-4

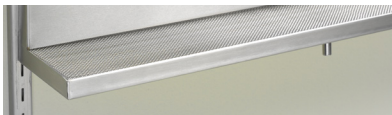


End View



End View

STAINLESS STEEL SCREEN INSERTS & DRAIN GRIDS



SCREEN INSERT



DRAIN GRID

The stainless steel screen inserts & drain grids are ideal for keeping items off the bottom of the trough. Also they can be utilized as a drying shelf. These items can be used with any Inter Dyne Systems drip trough or Victoria Style pegboard. 4" wide screen insert and drain grid shown at left.

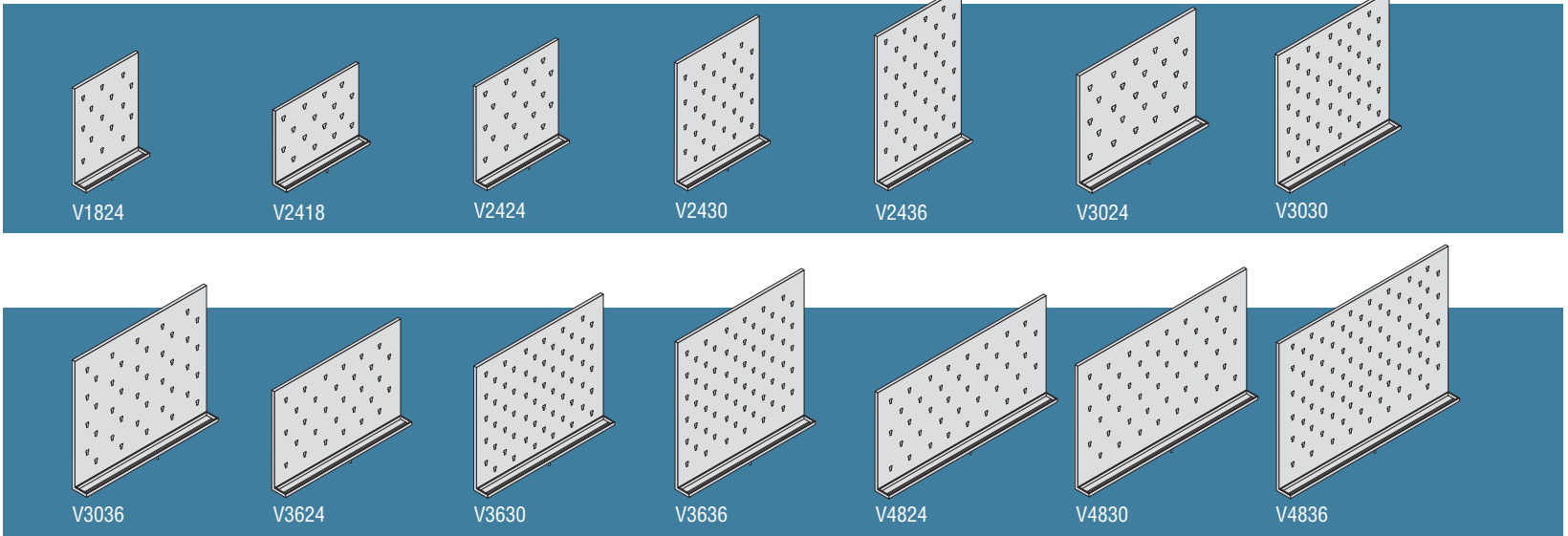
PEGBOARDS & ACCESSORIES

Inter Dyne Systems is the solution for outfitting your laboratory. Our pegboards, shelves, countertops, narcotic cabinets and specimen pass-through boxes are made of high-quality stainless steel to ensure a sterile and versatile workstation.

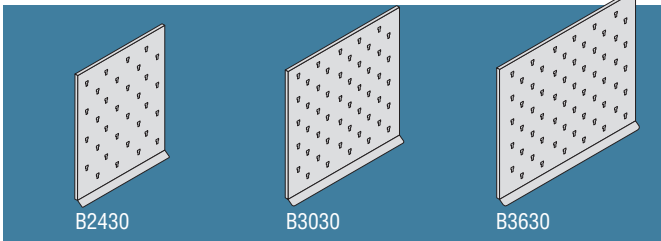
Our Mod-Rack™ pegboards come in a variety of sizes and mounting options and can be easily modified with our wide-selection of accessory options to meet the specific needs of your facility.

Contact a member of our friendly sales staff today to begin building your customized workstation.

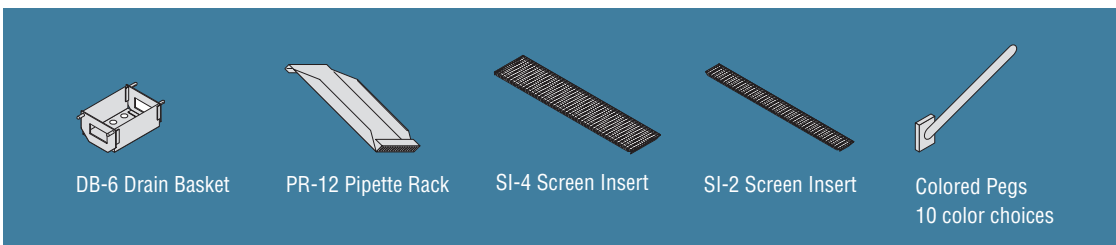
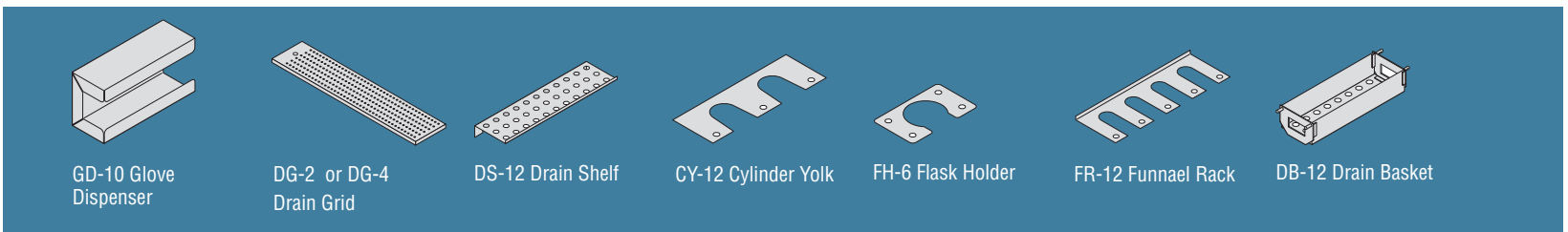
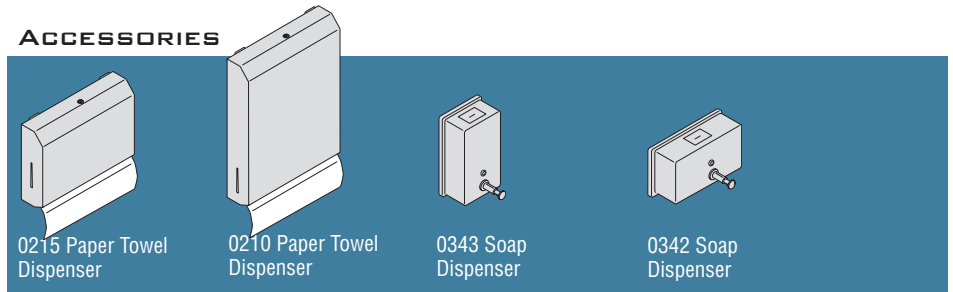
“V” VICTORIA PEGBOARDS



“B” BARON PEGBOARDS



ACCESSORIES



These products are covered by one or more of the following patents:
4,485,929; 3,912,212; 3,770,392; 5,163,567; 5,884,784



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W: www.interdynesystems.com

SECTION 12 56 53.13
PAINTED METAL LABORATORY CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Painted metal laboratory casework.
2. Provide and install painted metal casework in locations listed and as indicated on laboratory equipment drawings.

- B. Related Sections include the following:

1. Division 9 Section "Gypsum Board Assemblies" for sheet metal fastening ground in gypsum board partitions for anchoring laboratory casework.
2. Division 9 Section "Resilient Wall Base and Accessories" for resilient base applied to metal laboratory casework.
3. Division 11 Section 11621, "Laboratory Service Fixtures and Safety Equipment".
4. Division 11, Section 11622, "Laboratory Accessories", for benchtops, sinks, service chases, drying racks, adjustable shelving, cylinder restraints, etc.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide certification that casework, components and hardware has been tested in accordance to and meet the structural performance requirements as described in SEFA 8.

- B. Structural Performance: Provide metal laboratory casework capable of withstanding the following minimum loads without permanent deformation, excessive deflection, or binding of drawers and doors:

1. Shelves of Base, Wall, and Storage Cabinets: 100 lbs (45 kg).
2. Drawers: 150 lb (68 kg).
3. Wall Cabinets: 150 lb/ft (224 kg/m) along the width of the cabinet.
4. Floor-Supported Base Cabinets: 250 lb/ft (373 kg/m) along the width of the cabinet.

- C. Seismic Performance: Provide metal laboratory casework system capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever is more stringent.

1.4 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Shop Drawings: For metal laboratory casework. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate locations of blocking and other supports required for installing casework.
 - 2. Indicate locations and types of service fittings, together with associated service supply connection required.
 - 3. Include details of utility spaces including service chases showing supports for conduits and piping.
 - 4. Show adjacent walls, doors, windows, other building components, and other laboratory equipment. Indicate clearances from above items.
 - 5. Include coordinated dimensions for laboratory equipment, fume hoods and laboratory accessories specified in other Sections.
- C. Samples for Verification: 6-inch- (150-mm-) square samples for each type of finish, including top material.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.
- E. Product Test Reports: Based on tests performed by a qualified independent testing agency, indicate compliance with SEFA 3 and 8 for laboratory casework finishes and countertops with requirements specified for chemical and physical resistance.
- F. Coordinate shop drawings with other work involved.

1.5 QUALITY ASSURANCE

- A. Manufacturer shall identify and designate a full time factory representative for on-site supervision and coordination during the installation of laboratory casework and all components.
- B. Single Source Responsibility: Provide laboratory casework with tops, sinks, accessories, fume hoods and service fixtures, manufactured or furnished by same laboratory furniture company for single responsibility.
- C. Product Designations: Drawings indicate sizes and configurations of casework. Manufacturers' of casework of similar sizes, similar door and drawer configurations, and complying with the Specifications may be considered.
- D. Flammable Liquid Storage: Provide units that are listed and labeled as complying with the requirements of NFPA 30 for design, construction, and capacity of storage cabinets by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Cabinets shall be grounded and vented. (*verify with Mechanical Engineer, Client, Safety Officer and Code Official*)
 - 2. Coordinate with Electrical Contractor grounding lug locations.

3. Flammable base cabinets shall be fitted with two (2) 2" round flanged metal supply and exhaust connections directed toward service chase for connection to building exhaust system. Freestanding flammable storage cabinets shall be fitted with 2" round flanged connections as detailed on drawings. *(verify with Mechanical Engineer, Client, Safety Officer and Code Official)*
4. Cabinets shall have a minimum 2 inch deep liquid tight pan in bottom of same size as cabinet.
5. All OSHA cabinets shall be labeled in conspicuous lettering: "FLAMMABLE – KEEP FIRE AWAY".

E. Acid and Ventilated Storage-Cabinet:

1. Acid storage cabinets shall contain one full-width shelf. It shall be possible to locate shelf in four positions on 75mm (3") increments. Shelf supports shall be integrally molded into cabinet liner.
2. Cabinet and shelves shall each have a minimum 2 inch deep liquid tight pan of the same size of the shelf for spill containment.
3. Secure removable back panels in place with stainless steel screws fixed to vertical back framing members.
4. Provide plastic door roller catch.
5. All acid cabinets shall be labeled in conspicuous lettering: "ACID STORAGE".
6. Provide one threaded connection fusion welded to the rear of the cabinet. Thread shall be 2" NPT for connection to exhaust source. To be vented separately, see MECH for exhaust connection.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver laboratory casework until painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions" Article below.
- B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels through remainder of construction period.
- B. Existing Conditions: Verify casework dimensions with field measurements. Entry ways, corridors, and door openings shall be verified to ensure casework and equipment can be properly installed.

1.8 COORDINATION

- A. Coordinate layout and installation of metal framing, reinforcement and sheet metal

fastening grounds in gypsum board assemblies for support of metal laboratory casework.

1.9 EXTRA MATERIALS

- A. Furnish to Owner complete touchup kit for each type and color of laboratory casework provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged casework finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metal Laboratory Casework:
 - a. Air Master Systems Corp.
 - b. BMC National Products, Inc.
 - c. CiF Lab Solutions, c/o Stonecreek Interior Systems, LLC
 - d. ICI Institutional Casework Inc., Scientific c/o Farnell Contracting Inc.
 - e. Kewaunee Scientific Corp. c/o Farnell Equipment Company
 - f. Labcase c/o Detroit Technical Company
 - g. Lab Crafters
 - h. Mott Manufacturing Ltd. c/o Detroit Technical Company
 - 2. Substitutions: are subject to the review and approval of the architect. All products for consideration require documentation of equivalent performance to be submitted by the contractor.

2.2 MATERIALS

- A. Metal: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 366 (ASTM A 366M); matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Minimum Metal Thickness: Provide metal laboratory furniture components of the following minimum thicknesses:
 - 1. Fixed Panels including sides, ends, backs, bottoms, tops, soffits, and items not otherwise indicated: 18 ga., 0.0478 in (1.2 mm). Except for flammable liquid storage cabinets, bottoms may be 20 ga., 0.0359 in (0.9 mm) if reinforced.
 - 2. Removable access panels, doors, drawer fronts and cabinet bodies, security panels, sloped tops and shelves: 20 ga., 0.0359 in (0.9 mm). For back panels and doors for flammable storage cabinets, use 18 ga., 0.0478 in (1.2 mm) thick metal. For shelves more than 36 in (900 mm) long, use 18 ga., 0.0478 in (1.2 mm) thick metal or provide suitable reinforcement.
 - 3. Top, front and intermediate horizontal rails, aprons, stretchers, cross rails, table legs,

- center posts, frames and gussets: 16 ga., 0.0598 in (1.5 mm).
4. Drawer suspensions, L-shaped front corner gussets sink supports, and hinge reinforcements: 14 ga., 0.0747 in (1.9 mm).
 5. Table leg corner brackets and leveler gussets: 12 ga., 0.1046 in (2.7 mm).
- C. Acid and Ventilated Storage-Cabinet Lining: ¼ inch (6 mm) thick, glass-fiber cement board complying with ASTM C 1186.
- D. Clear Tempered Glass for Glazed Doors: with ground edges ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3, 7/32 in (5.5 mm) thick or Clear Laminated Safety Glass for Doors: ASTM C 1172, Kind LT; Kind FT, Condition A, Type I, Class I, Quality q3 lites with clear, polyvinyl butyryl interlayer.

2.3 FABRICATION

- A. General: Complete assembly and finish work at point of manufacture. Perform assembly on precision jigs to provide units which are square; fully reinforced with angles, gussets, and channels; and integrally framed and welded to form a dirt and vermin-retardant enclosure. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).
- B. Fabricate units on precision dies for interchangeability of like-size drawers, doors, and similar parts.
- C. Design: Full Flush Overlay.
- D. Flat Panel Doors: Outer and inner pans formed and telescoped into box formation, with channel reinforcement's full height on center of each pan. Fill doors solid with noncombustible, sound-deadening material.
- E. Glazed Doors: Hollow-metal stiles and rails of similar construction as flat panel doors and welded corners, with glass held in resilient channels or gasket material.
- F. Hinged Doors: Mortise at flanges for hinges and reinforce with angles, welded inside inner pans at hinge edge.
- G. Flat Panel Drawers: Assemble fronts from telescoping outer and inner pans, designed to eliminate raw edge of steel at top. Fabricate sides, back, and bottom of one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Weld drawer front to sides, back, and bottom to form a single, integral unit. Provide drawers with rubber bumpers, runners, and positive stops to prevent metal-to-metal contact or accidental removal.
- H. Adjustable Shelves: Front, back, and ends formed down with returned lip at front and back.
- I. Toe Space: Provide an adjustable height metal toe space, fully enclosed, adjustable in height from a minimum 4in to a maximum 6 in high set 3 inches (75 mm) back from the face of the cabinet, with no open gaps or pockets. The adjustable height shall provide backing for the resilient base in the event of varying floor elevations.

- J. Base Molding: 4 in high, black rubber or vinyl.
- K. Table Legs: Not less than 2 in (50 mm) square, welded tubing. Provide leg stretchers where necessary to comply with structural performance requirements. Weld or bolt leg stretchers to legs and cross-stretchers. Securely bolt legs to table aprons. Provide leveling device welded to bottom of each leg.
- L. Leg Shoes: Vinyl or rubber, black, open-bottom type.
- M. Utilities: Provide space, cutouts, and holes for pipes, ductwork, conduits, and fittings in cabinet bodies to accommodate utility services and their support-strut assemblies.
- N. Service Chase Framing: Manufacturer's standard steel framing units consisting of 2 cold-rolled C-channel uprights, not less than 1-5/8 inches (41 mm) square by 0.10 inch (2.5 mm) thick, connected together at the top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch (32-by-6-mm) flat bars. Framing units may be made by welding C-channel material specified for uprights into rectangular frames instead of using U-shaped brackets.
- O. Filler Strips: Provide as needed to close space between cabinets and walls, ceilings, and indicated equipment. Fabricate from the same material and with the same finish as cabinets. Hem exposed edges.
- P. Closure Panels: Closure panels shall be fabricated from the same material and with the same finish as cabinets, and shall mount flush with the front edge of the cabinet, self supporting and extend vertically to underside of finished ceiling.
- Q. Coat Hooks: Hooks shall be formed cold roll steel with ball end tips and welded in stamped steel base. Three (3) under mount designs (double, triple, wardrobe) and three (3) wall mount designs (single, double, schoolhouse). Styles shall be design coordinated with quality matte nickel plated finish. Attachment with #10 screws. (Cast hooks susceptible to breakage, non-matching finishes or designs, and smaller screw mounting not acceptable.)
- R. Mobile Instrument Carts:
 - 1. Nominal Dimensions:
 - a. Width: 24", 36", 48", 60", 72"
 - b. Depth: 34"
 - c. Height: 78"
 - 2. Casters: Four per cart assembly. 4" x 1.25" wheels with grey non-marking tire. Each caster shall have a 300 pound load rating. Front two casters shall be equipped with a modern total lock (locks both wheel rotation and caster swivel). Casters shall be attached to extreme corners of the cart base by threading into welded inserts.
 - 3. Cart base assembly: Cart base assembly shall be fabricated from 1.5" x 3" rectangular tube steel of 16 gage wall thickness. Base shall be welded together with neat, professional MIG weld fillets. For maximum strength, fillets shall be left unground. Mobile cart base shall be in a "C" shape with two members across the back and one member at each end. Cart base shall be open at front to allow knee space for seated users. Vertical upright attachment members of 24" in length shall be welded to each end of the "C" shaped base. All open tube ends shall be plugged with black plastic plugs.

4. Slotted vertical uprights shall be the same construction and hole pattern as other steel laboratory furniture system components. Slotted uprights shall be bolted to vertical upright attachment members using four 5/16" socket head cap screws. Screws shall be concealed beneath snap in plugs.
 - a. All hanging components attached to vertical uprights shall be adjustable in 1" increments.
5. Mobile Instrument Cart shall accept all shelves, cantilevered work surfaces suspended casework and upper storage cabinets designed for other steel laboratory furniture system components.
6. Fully assembled 78" high instrument cart shall support the following components. Each component has an individual maximum load, but total load shall not exceed 1000 pounds.
 - a. Shelves - 6", 8", 12" - 180 lbs.; 18" - 130 Lbs.; 24" - 100 lbs.
 - b. Wall cases - 300 Lbs
7. One cantilever work surfaces - 600 Lbs each (includes weight of work surface and suspended cabinets (if any))

2.4 FINISH FOR METAL LABORATORY CASEWORK

- A. Cleaning and Pretreatment: After assembly, thoroughly clean surfaces of grease, dirt, oil, flux, and other foreign matter by physical and chemical means. Treat entire unit with metallic phosphate process, leaving surfaces with uniform, fine-grained, crystalline phosphate coating to provide bond for finish.
- B. Chemical-Resistant Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, chemical-resistant, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and 2 mils (0.05 mm) for system.
- C. Chemical and Physical Resistance of Finish System: Provide metal laboratory casework with finish system complying with the following requirements for chemical and physical resistance:
 1. Chemical Resistance, Moisture Resistance, Cold Crack and Adhesion and Flexibility: Compliant testing and performance requirements as outlined by with SEFA 3 and SEFA 8 standards.
 2. Chemical Resistance: Capable of withstanding application of not less than 5 drops (0.25 mL) of the following reagents applied to finish surface; covered with a watch glass for 60 minutes, rinsed, and dried; with no permanent change in gloss, color, film hardness, adhesion, or film protection.
 - 1) Acetic acid (98%)
 - 2) Acetone
 - 3) Acid Dichromate (5%)
 - 4) Ammonium hydroxide (28 %)
 - 5) Amyl Acetate

- 6) Benzene
- 7) Carbon tetrachloride
- 8) Chloroform
- 9) Chromic Acid (60%)
- 10) Cresol
- 11) Dichlor Acetic Acid
- 12) Dimethylformamide
- 13) Dioxane
- 14) Ethyl acetate
- 15) Ethyl alcohol
- 16) Ethyl ether
- 17) Formaldehyde (37 %)
- 18) Formic acid (90%)
- 19) Furfural
- 20) Hydrochloric acid (37 %)
- 21) Hydrofluoric Acid (48%)
- 22) Hydrogen peroxide (5%)
- 23) Iodine
- 24) Methyl ethyl ketone
- 25) Methylene chloride
- 26) Mono chlorobenzene
- 27) Naphthalene
- 28) Nitric acid (60 %)
- 29) Phenol (90%)
- 30) Phosphoric acid (85 %)
- 31) Potassium hydroxide (40 %)
- 32) Silver nitrate
- 33) Sodium carbonate (saturated)
- 34) Sodium chloride (saturated)
- 35) Sodium hydroxide (40 %)
- 36) Sodium sulfide (saturated)
- 37) Sulfuric acid (85 %)
- 38) Toluene
- 39) Trichloroethylene
- 40) Xylene
- 41) Zinc chloride (saturated)

3. Moisture Resistance: No visible effect when exposed to the following:
 - a. Hot water at a temperature of 190 to 205 deg F (88 to 96 deg C), trickled down the surface at a 45-degree angle for 5 minutes.
 - b. Constant moisture using a 2 in x 3 in x 1 in (51 mm x 76 mm x 25 mm) cellulose sponge, soaked with water, in contact with surface for 100 hours.
4. Cold Crack: No effect when subjected to 10 cycles of temperature change from 20 deg F (minus 7 deg C) for 60 minutes to 125 deg F (52 deg C) for 60 minutes.
5. Adhesion and Flexibility: No peeling or cracking or exposure of metal when metal is bent 180 degrees over a ½ in (13 mm) diameter mandrel.

- D. Colors: Comply with the following requirements for colors of metal laboratory casework finish:
 - 1. Colors: Provide manufacturer's full range of standard colors and finishes for selection by laboratory architect.

2.5 CASEWORK HARDWARE

- A. Hardware, General: Provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: Stainless-steel, 5-knuckle hinges complying with BHMA 156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors less than 48 inches (1200 mm) high and 3 for doors more than 48 inches (1200 mm) high.
- C. Pulls: Stainless steel, fastened from back with 2 screws. For sliding doors, provide stainless-steel recessed flush pulls. Provide 2 pulls for drawers more than 24 inches (600 mm) wide.
- D. Door Catches: Nylon-roller spring catch or dual, self-aligning, permanent magnet catch with strike. Provide 2 catches on doors more than 48 inches (1200 mm) high.
- E. Drawer Guides: Metal-channel, self-closing drawer guides, designed to prevent rebound when drawers are closed, with nylon-fired, ball-bearing rollers for self centering operation, capable of supporting 100 lbs. (45 kg.) and complying with BHMA A156.9, Type B05091.
- F. Full Extension Interior Drawer Guides: Accuride or equivalent drawer guide all ball bearing, rail mount, clear zinc finish and capable of supporting 100 lbs. (45kg.) at 33 inches wide or less or 200 lbs (90 kg) for 42 inches wide or less.
 - 1. Provide where indicated on drawings.
- G. Shelf Clips: Die-formed steel, zinc plated or 14 ga steel. They are to be adjustable vertically in 1 in increments.
- H. Number Plates and Label Holders: Stainless steel or chrome plated, sized to receive standard label cards approximately 1 by 2 ½ inches (25 by 63 mm), attached with screws or rivets.
 - 1. Provide where indicated on drawings.
- I. Drawer and Cupboard Locks: Half-mortise or cylindrical type, 5-pin tumbler and dead bolt or cam, only cylinder exposed, brass with chrome-plated finish, complying with BHMA A156.11, Grade 1. *Tumbler lock hardware option.*
 - 1. Provide minimum of 2 keys per lock and 6 master keys.
 - 2. Provide where indicated on drawings.
- J. Sliding-Door Hardware Sets: Manufacturer's standard extruded aluminum shoe with integral pulls and ball bearing wheel assemblies which slides in top and bottom extruded aluminum track.

- K. Sinks, General: Provide sizes as indicated on drawings or manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 - 1. Shelf Thickness: 3/4 inch (19 mm) for spans up to 36".
 - 2. Match Architect's sample.
- L. Security Panel: Provide panels at every drawer requiring a lock.
 - 1. Provide as indicated on drawings.
- M. Padlock Eyes: Provide drawers with manufacturer standard padlock eyes and protective faceplates at locations identified on lab equipment plans. Drawers with padlock eyes also require security panels and numbered label plates. Padlockable eyes to be edge or face mount as is compatible with cabinet and drawer style. Provide 304 stainless steel with 1 15/16" projection, 5/8" padlock shackle diameter, 2 1/8" x 7/8" x 3/16" thick strike plate with 3 flush rivets or counter sunk mounting screws. Padlock eyes and attachment must not impede drawer function.
- N. Numbered Label Plates: Where drawers are indicated to receive padlock eyes also provide 304 stainless steel sequentially numbered plates for identification, measuring 2-3/8 inches by 1-1/4 inches with pre-drilled rivet holes and rivets. Numbers with black Lettering beginning with "001".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcement, and other conditions affecting performance of metal laboratory casework installation.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

- A. Install plumb, level, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Utility-Space Framing: Secure to floor with 2 fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.
- C. Base Cabinets: Set cabinets straight, plumb, and level. Adjust subtops within 1/16 inch (1.5 mm) of a single plane. Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch (1.5 mm).
 - 1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space

with concealed fasteners spaced 24 inches (600 mm) o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than 2 fasteners.

- D. Wall Cabinets: Hang cabinets straight, plumb, and level. Adjust fronts and bottoms within 1/16 inch (1.5 mm) of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches (600 mm) o.c. Align similar adjoining doors to a tolerance of 1/16 inch (1.5 mm).
- E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises, unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- F. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF ACCESSORIES

- A. Install accessories according to approved Shop Drawings and manufacturer's written instructions. Coordinate locations and installation at all laboratory accessories specified in Section 11622.
- B. Securely fasten all casework, service chase frames, shelving, to metal fastening grounds or walls.

3.4 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at minimum of 48 inches (1200 mm) o.c.

END OF SECTION

SECTION 12 56 53

FLEXIBLE LABORATORY FURNITURE SYSTEM

PART 1 – GENERAL

Summary:

This Specification identifies the minimum material and construction standards that are required to deliver a quality installation of the flexible laboratory furniture system. Laboratory furniture shall be supplied in accordance with the requirements of this Specification. The laboratory furniture identified in this Specification shall include the miscellaneous metal panels and other related components as identified on the drawings and that are necessary for the complete installation.

1.1 SECTION INCLUDES

- A. Modular Support Structure
- B. Structural Table Base
- C. Mobile Base / Wall Cabinets
- D. Shelves
- E. Fixtures
- F. Service Connections

1.2 RELATED SECTIONS

- 1. Section 07 92 00, "Joint Sealers.
- 2. Section 09 21 16, "Gypsum Board Assemblies" for sheet metal fastening ground in gypsum board partitions for anchoring laboratory casework.
- 3. Section 09 65 13 "Resilient Wall Base and Accessories" for resilient base applied to metal laboratory casework.
- 4. Section 11 53 33, "Laboratory Safety Equipment".
- 5. Section 11 53 43.10, "Laboratory Accessories", for benchtops, sinks, service chases, drying racks, adjustable shelving, cylinder restraints, etc.
- 6. Divisions 22 and 26, Sections for plumbing and electrical requirements.
- 7. Divisions 22 and 26, Sections for final connections to building services and systems.

1.3 REFERENCES

- A. SEFA 8: Laboratory Furniture – Casework, Shelving and Tables Guidelines
Science Equipment and Furniture Association (SEFA)
- B. ISO 9001:2000 – Quality Management
International Standards Organization (ISO)

C. ADA (ATBCB ADAAG) Americans with Disabilities Act Accessibility Guidelines
Americans with Disabilities Act (ADA)

1.4 SUBMITTALS

Refer to Section 01 33 00, "Submittal Procedures," for requirements, procedures, etc.

A. Product Data:

Drawings shall include data and details for construction of the laboratory furniture as well as information regarding the name, quantity, type and construction of materials (such as hardware, gauges, etc), that will be used to complete the project.

B. Shop Drawings:

1. The laboratory furniture manufacturer shall furnish shop drawings illustrating the layout and placement of all laboratory furniture, casework and fume hoods as well as any products included in this section.
2. Indicate the type and location of all service fittings and associated supply connections.
3. Preparation instructions and recommendations.
4. Storage and handling requirements and recommendations.
5. Installation methods.

C. Selection Samples:

Submit the following:

1. One complete set of color chips representing the manufacturer's full range of available colors. Minimum sample size 2 inches by 3 inches (50mm x 76mm).

D. Quality Assurance/Control

1. Design Data/Test Reports: Manufacturer shall submit test data and design criteria which are in compliance with the project specifications.
2. Certificates: All certifications required in the specifications shall be submitted with the original submittal package under separate cover. Certificates must be provided with the signature of a qualified individual of the supplier.
3. Manufacturers' Instructions: Provide manufacturer's instructions for installation and maintenance of all products provided and installed within this section. Instructions will be in bound form, tabbed and organized by section number.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

The following list of information will be provide to the Architect at least ten (10) days prior to the bid opening:

1. List of manufacturing facilities;
2. Construction details depicting the materials, sizes and methods of construction;

1.6 DELIVERY, STORAGE AND HANDLING

A. Packaging, Shipping, Handling and Unloading

1. Packaging: Products shall have packaging adequate enough to protect finished surfaces from soiling or damage during shipping, delivery and installation.
2. Delivery: Casework delivery shall only take place after painting, utility rough-ins and related activities are completed that could otherwise damage, soil or deteriorate casework in installation areas.
3. Handling: Care, such as the use of proper moving equipment, experienced movers, etc., shall be used at all times to avoid damaging the casework. Until installation takes place, any wrapping, insulation or other method of protection applied to products from the factory will be left in place to avoid accidental damage.

B. Acceptance at Site:

Casework will not be delivered or installed until the conditions specified under Part 3, Installation section of this document have been met.

C. Storage:

Casework shall be stored in the area of installation. If, prior to installation, it is necessary for casework to be temporarily stored in an area other than the installation area, the environmental conditions shall meet the environmental requirements specified under the Project Site Conditions article of this section.

D. Waste Management and Disposal:

The supplier of the laboratory casework is responsible for removing any waste or refuse resulting from the installation of, or work pertaining to laboratory casework; thereby leaving the project site clean and free of debris. Trash container(s) to be provided by others.

1.7 PROJECT SITE CONDITIONS

- A. Building must be enclosed (windows and doors sealed and weather-tight);

- B. An operational HVAC system that maintains temperature and humidity at occupancy levels must be in place;
- C. Adjacent and related work shall be complete;
- D. Ceiling, overhead ductwork and lighting must be installed;
- E. Site must be free of any further construction such as "wet work";
- F. Required backing and reinforcements must be installed accurately and the project must be ready for casework installation.

1.8 WARRANTY

- A. Furnish a written warranty that work performed under this section shall remain free from defects as to materials and workmanship for a period of two (2) years from date of shipment. Defects in materials and workmanship that may develop within this time are to be replaced without cost or expense to the Owner.

Defects include, but are not limited to:

- 1. Ruptured, cracked, or stained coating
 - 2. Discoloration or lack of finish integrity
 - 3. Cracking or peeling of finish
 - 4. Slippage, shift, or failure of attachment to wall, floor, or ceiling
 - 5. Weld or structural failure
 - 6. Warping or unloaded deflection of components
 - 7. Failure of hardware
- B. The warranty with respect to products of another manufacturer sold by Mott Manufacturing is limited to the warranty extended by that manufacturer to Mott Manufacturing.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Flexible Furniture:
 - a. Air Master Systems Corp.
 - b. Case Systems, c/o Stonecreek Interior Systems, LLC
 - c. CiF Lab Solutions, c/o Stonecreek Interior Systems, LLC

- d. HLS Hanson Lab Solutions.
- e. ICI Institutional Casework Inc., Scientific c/o Farnell Contracting Inc.
- f. Kewaunee Scientific Corp. c/o Farnell Equipment Company
- g. Labcase c/o Detroit Technical Company
- h. Lab Crafters
- i. Mott Manufacturing Ltd. c/o Detroit Technical Company
- j. VWR.

B. Substitutions:

- 1. Must meet all specification requirements and have prior approval.
- 2. Must meet the minimum design and performance requirements of SEFA and UL 962.

C. Requests for substitutions:

All requests will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS

A. Sheet Steel:

Mild steel, cold rolled furniture grade to requirements of ASTM A1008/A1008M, Grade C or higher, with smooth surfaces to furniture quality.

B. Galvanized Sheet Steel:

Commercial quality galvanised sheet steel to ASTM 653, Designation Z275.

C. Stainless Steel:

- 1. Sheet: ASTM A240, type 304 and 316 alloy.
- 2. Finish: Unless otherwise indicated, AISI No. 4 brushed finish.

D. Glass:

Glass, ½" thick with steel frame work to protect edges.

2.3 DESIGN REQUIREMENTS:

Basis of design: Mott Manufacturing Altus Series Table system

- A. Modular system to be made of tubular style framing combined with rectangular formed steel uprights.
- B. Tubular Frames / Table Supports to be adjustable height in 1" increments and complete with levelers.
- C. Rear frame to be used for carrying services and electrical conduit.
 - 1. Rear upright supports to be equipped with slots for adjustable shelving and levelers.
 - 2. All services supplied with hose and quick disconnect to reach ceiling panel supply.
- D. Assembled frame to be self-supporting without needing to be anchored to the building.
- E. The modular system must ship complete from the factory with minimal on-site assembly.

2.4 ALTUS CONSTRUCTION

A. Rear Support Structure:

1. Nominal rear frame dimensions: Width: 48", 60", 72", Depth: 3", Height: 84"
 2. Rear Uprights:
 1. 2" x 3" 14 ga. powder coated cold rolled steel or stainless steel.
 2. 2" diameter nylon leveling glide 3/8" x 2-1/2" long threaded stem.
 3. Upper Cross Rail: 16 ga. powder coated cold rolled steel or stainless steel.
 4. Load Capacity: Rear Upright to support up to 3 shelves loaded to a combined maximum of 300lbs. Shelf depths available as 12" or 15" deep.
 5. Uprights to house services, electrical and data cables: High voltage cabling to be in a separate upright from gas piping.
 6. Wire management tray to be under countertop.
 7. Rear posts have slots punched on 1" increments starting at nominal 59" above the finished floor.
- B. Tubular Table Assembly:
1. Nominal table assembly dimensions: Width: 48", 60", 72", Depth: 23" or 29", Height: Adjustable from 29" – 36" (not including work surface).
 2. Tubular Table Legs:
 1. 2" outside square, 14ga. powder coated cold rolled steel or stainless steel outer leg.
 2. 1-3/4" outside square, 11 ga. powder coated cold rolled steel or stainless steel inner telescoping leg.
 3. 2" diameter nylon leveling glide 3/8" x 2-1/2" long threaded stem
 3. Capable of vertical height adjustment in 1" increments.
 4. Table assembly to be fastened to the rear upright with two (2) hex 3/8" socket head bolts.
 5. Hanging Rails: Front apron and rear support are to have rails allowing suspended cabinets to hang from.
 6. Leveling Bolt: Frame to be fitted with a leveling bolt which will allow the legs to be adjusted for proper alignment of work surface height.
 7. Load Capacity: Table frame to support 1000lbs including the work surface.
- C. Shelves:
1. Nominal shelf dimensions: Width: 48", 60", 72". Depth: 12" or 15" for shelves. 1" thick.
 2. Shelf requirements:
 1. Shelves constructed of powder coated cold rolled steel, or stainless steel.
 2. Wood Shelves are only available for table widths up to 60".
 3. Shelves to be flush with the face of the rear rectangular posts.
 4. Shelf brackets to be constructed powder coated cold rolled steel or stainless steel.
 5. Bottom and middle shelves to have a rear 1" high retaining lip. Top shelf assemblies do not come with retaining lip.
 6. Vertical shelf adjustment in 1" increments.
 7. Optional 1" tall x 5/16" dia. shelf retainer rods, available in #304 stainless steel or #304 powder coated stainless steel.
- D. Suspended/Mobile Base Cabinets:
1. Design and construction to be as in section 12 35 53 - Laboratory Metal Casework and 12 35 53 – Laboratory Wood Casework.
 2. Mobile cabinets to have casters in lieu of a toe kick. Casters to all be rated for 165lbs minimum each and to be locking type. Cabinet height must ensure 2-1/2" of clearance under the table frame.
 3. Suspended base cabinets: Provide a system of steel hanger rails attached to the casework frames. Installation and removal to be accomplished without the use of tools.
- E. Plumbing/Fixtures:
1. Rear upright structure to support a maximum of three plumbing fixtures on left side.

2. Fixtures to be needle valve style with a single serrated hose end angled down towards countertop. Fixture finish as per Section 11 53 43 - Service Fittings and Fixtures.
 3. Plumbing lines to be polyurethane routed out the top of the upright.
 4. All burning gas tubing to be specified as stainless steel.
 5. All plumbing to have service hose at the top of the upright with additional 4' of hose length to reach the ceiling supply panel.
 6. Plumbing to be arranged that they services cannot be intermixed.
 7. All service valves and quick disconnects to be keyed and color coded. Only plug and body connects of the same key will couple and allow flow.
- F. Service Connections:
1. Electrical, data and plumbing services to terminate with cable or hose coming out of the top of the rear support upright.
 2. Electrical services to have a 20 amp cord extending 4' above the top of the upright.
 3. Data services to have a male plug extending 4' above the top of the upright.

2.3 STEEL FURNITURE FINISH

1. Metal finish to be as per finish schedule.

PART 3 – EXECUTION

3.1 INSTALLATION

1. Install casework within system, align and set level with levelling devices, in accordance with shop drawings.
2. At wall locations secure wall cabinets to face of finished walls and partitions, applying self-tapping screws through wall finish material into each concealed stud flange.
3. Install components to effect a secure, neat and complete installation.

END OF SECTION

SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Escutcheons.
- C. Mechanical couplings.
- D. Pipe hangers and supports.
- E. Retrofit - sprinkler piping cover system.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

- A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- D. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
- E. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- F. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- G. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- H. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.
- I. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

- J. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- K. AWWA C606 - Grooved and Shouldered Joints; 2022.
- L. FM (AG) - FM Approval Guide; Current Edition.
- M. ITS (DIR) - Directory of Listed Products; Current Edition.
- N. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
- C. Installer's qualification statement.
- D. Project Record Documents: Record actual locations of components and tag numbering.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 - 1. Minimum three years experience.
- B. Comply with FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey requirements.
- C. Valves: Bear FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- D. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- E. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Sprinkler-based System:
 - 1. Comply with NFPA 13.
 - 2. See Section 211300.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 40, black.
 - 1. Steel Fittings: ASME B16.5 steel flanges and fittings.
 - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
 - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
 - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 ESCUTCHEONS

- A. Manufacturers:
 - 1. Fire Protection Products, Inc: www.fppi.com/#sle.com/#sle.
 - 2. Viking Group Inc: www.vikinggroupinc.com/#sle.
 - 3. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Material:
 - 1. Metals and Finish: Comply with ASME A112.18.1.
- C. Construction:
 - 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
 - 2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.04 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.
 - 1. Manufacturers:
 - a. AFCON, a brand of Anvil International: www.anvilintl.com/#sle.
 - b. FNW: www.fnw.com/#sle.

- c. Substitutions: See Section 016000 - Product Requirements.
- B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 1. Manufacturers:
 - a. AFCON, a brand of Anvil International: www.anvilintl.com/#sle.
 - b. FNW: www.fnw.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- C. Nonmetallic Piping Hangers:
 - 1. Manufacturers:
 - a. DecoShield Systems, Inc; Snap-2 Hangers: www.decoshield.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

2.05 MECHANICAL COUPLINGS

- A. Manufacturers:
 - 1. Anvil International: www.anvilintl.com/#sle.
 - 2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
 - 3. Victaulic Company; FireLock Style 009H: www.victaulic.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Rigid Mechanical Couplings for Grooved Joints:
 - 1. Dimensions and Testing: Comply with AWWA C606.
 - 2. Minimum Working Pressure: 300 psig (2065 kPa).
 - 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
 - 4. Housing Coating: Factory applied orange enamel.
 - 5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
 - 6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.

- D. Group piping whenever practical at common elevations.
 - E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - F. Pipe Hangers and Supports:
 - 1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
 - H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
 - I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
 - 2. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
 - J. Escutcheons:
 - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 - 3. Attach plates at the underside only of suspended ceilings.
 - 4. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
 - K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- 3.03 CLEANING
- A. Upon completion of work, clean all parts of the installation.

- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 210523
GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Two-piece ball valves with indicators.
- B. Bronze butterfly valves with indicators.
- C. Check valves.
- D. Trim and drain valves.

1.02 RELATED REQUIREMENTS

1.03 ABBREVIATIONS AND ACRONYMS

- A. EPDM: Ethylene-propylene diene monomer.
- B. PTFE: Polytetrafluoroethylene.

1.04 REFERENCE STANDARDS

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Obtain valves for each valve type from single manufacturer.
- B. Where listed products are specified, provide products listed, classified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.
- C. Installer Qualifications:

1. Company specializing in performing the work of this section with minimum five years documented experience.
2. Trained and approved by manufacturer to design, install, test and maintain the equipment specified herein.
3. Complies with manufacturer's certification requirements.
4. Complies with manufacturer's insurance requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 1. Protect internal parts against rust and corrosion.
 2. Protect threads and flange faces.
 3. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors and maintain at higher than ambient dew point temperature.
 - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
- C. Use the following precautions for handling:
 1. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
 1. Main Level: HAMV - Fire Main Equipment.
 - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
 - b. Level 1: HLOT - Valves.
 - c. Level 3: HLUG - Ball Valves, System Control.
 - d. Level 3: HLXS - Butterfly Valves.
 - e. Level 3: HMER - Check Valves.
 - f. Level 3: HMRZ - Gate Valves.
 2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
 - a. Level 1: VQGU - Valves, Trim, and Drain.
- B. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:
 1. Automated Sprinkler Systems:
 - a. Valves:
 - 1) Gate valves.
 - 2) Single check valves.

- C. ASME Compliance:
 - 1. ASME B1.20.1 for threads on threaded-end valves.
- D. Comply with NFPA 13 and NFPA 13R for valves.
- E. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Handwheel: For other than quarter-turn trim and drain valves.
 - 2. Hand-lever: For quarter-turn trim and drain valves 2 NPS (50 DN) and smaller.

2.02 TWO-PIECE BALL VALVES WITH INDICATORS

- A. Manufacturers:
 - 1. FNW: www.fnw.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. UL 1091, except with ball instead of disc and FM (AG) standard listing for indicating valves (butterfly or ball type), Class Number 1112.
- C. Description:
 - 1. Minimum Pressure Rating: 175 psig (1200 kPa).
 - 2. Body Design: Two piece.
 - 3. Body Material: Forged brass or bronze.
 - 4. Port Size: Full or standard.
 - 5. Seat: PTFE.
 - 6. Stem: Bronze or stainless steel.
 - 7. Ball: Chrome-plated brass.
 - 8. Actuator: Worm gear or traveling nut.

2.03 BRONZE BUTTERFLY VALVES WITH INDICATORS

- A. Manufacturers:
 - 1. FNW: www.fnw.com/#sle.
- B. UL 1091 and FM (AG) standard listing for indicating valves, (butterfly or ball type), Class Number 1112.
- C. Minimum Pressure Rating: 175 psig (1200 kPa).
- D. Body Material: Bronze.
- E. Seat: EPDM.
- F. Stem: Bronze or stainless steel.
- G. Disc: Bronze with EPDM coating.
- H. Actuator: Worm gear or traveling nut.

2.04 CHECK VALVES

- A. Manufacturers:
 - 1. FNW: www.fnw.com/#sle.
 - 2. Kennedy Valve; AWWA Compliant: www.kennedyvalve.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.
- C. AWWA C508 compliant check valves.
- D. Minimum Pressure Rating: 175 psig (1200 kPa).
- E. Type: Center guided check valve.
- F. Body Material: Cast iron, ductile iron.
- G. Center guided check with elastomeric seal.
- H. Hinge Spring: Stainless steel.
- I. End Connections: Flanged, grooved, or threaded.

2.05 TRIM AND DRAIN VALVES

- A. Ball Valves:
 - 1. Description:
 - a. Pressure Rating: 175 psig (1200 kPa).
 - b. Body Design: Two piece.
 - c. Body Material: Forged brass or bronze.
 - d. Port Size: Full or standard.
 - e. Seat: PTFE.
 - f. Stem: Bronze or stainless steel.
 - g. Ball: Chrome-plated brass.
 - h. Actuator: Hand-lever.
 - i. End Connections for Valves 1 NPS (25 DN) through 2-1/2 NPS (65 DN): Threaded ends.
 - j. End Connections for Valves 1-1/4 NPS (32 DN) and 2-1/2 NPS (65 DN): Grooved ends.
- B. Globe Valves:
 - 1. Description:
 - a. Pressure Rating: 175 psig (1200 kPa).
 - b. Body Material: Bronze with integral seat and screw-in bonnet.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc Holder and Nut: Bronze.
 - f. Disc Seat: Nitrile.
 - g. Packing: Asbestos free.

- h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.

3.02 INSTALLATION

- A. Comply with specific valve installation requirements and application in the following Sections:
 - 1. Section 211300 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
 - 1. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Valves with threaded connections to have unions at equipment arranged for easy access, service, maintenance, and equipment removal without system shutdown.
- D. Valves in horizontal piping installed with stem at or above the pipe center.
- E. Position valves to allow full stem movement.
- F. Install valve tags. Comply with Section 210553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 210553
IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Automatic Controls: Tags.
- B. Instrumentation: Tags.
- C. Major Control Components: Nameplates.
- D. Piping: Pipe markers.
- E. Valves: Tags and ceiling tacks where above lay-in ceilings.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 2. Seton Identification Products, a Tricor Direct Company: www.seton.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Background Color: Black.
 - 2. Thickness: 1/8 inch (3 mm).
 - 3. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation: www.bradycorp.com/#sle.
 - 3. Brimar Industries, Inc: www.pipemarket.com/#sle.
 - 4. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 5. Seton Identification Products, a Tricor Direct Company: www.seton.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com/#sle.
 - 2. Brimar Industries, Inc: www.pipemarket.com/#sle.
 - 3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 5. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- D. Color code as follows:
 - 1. Fire Quenching Fluids: Red with white letters.

2.05 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- E. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 211300
FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; Current Edition.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
 - 3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.
- C. Designer's qualification statement.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.
- F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.
 - 2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
 - 3. Sprinkler Wrenches: For each sprinkler type.
- H. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.06 QUALITY ASSURANCE

- A. Comply with FM (AG) requirements.
- B. Designer Qualifications: Design system under direct supervision of a Certified Fire Protection Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience and approved by manufacturer.
- E. Equipment and Components: Provide products that bear FM (AG) label or marking.
- F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
 - 1. Anvil International: www.anvilintl.com/#sle.
 - 2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
 - 3. Viking Corporation: www.vikinggroupinc.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Ordinary hazard, Group 1; comply with NFPA 13.

- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Interface system with building fire and smoke alarm system.
- E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.03 SPRINKLERS

- A. Suspended Ceiling Type: Recessed pendant type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Upright type with guard.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- C. Guards: Finish to match sprinkler finish.
- D. Flexible Drop System: Stainless steel, multiple use, open gate type.
 - 1. Application: Use to properly locate sprinkler heads.
 - 2. Include all supports and bracing.
 - 3. Provide braided type tube as required for the application.
 - 4. Manufacturers:
 - a. FlexHead Industries, a brand of Anvil International: www.anvilintl.com/#sle.
 - b. Victaulic Company; Vic-Flex: www.victaulic.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- G. Flush entire piping system of foreign matter.
- H. Install guards on sprinklers where indicated.

- I. Hydrostatically test entire system.
- J. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 220517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.
- B. Pipe sleeve-seals.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 099113 - Exterior Painting: Preparation and painting of exterior piping systems.
- C. Section 099123 - Interior Painting: Preparation and painting of interior piping systems.
- D. Section 220523 - General-Duty Valves for Plumbing Piping.
- E. Section 220719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- C. FM (AG) - FM Approval Guide; Current Edition.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

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

- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B. Pipe Passing Through Below Grade Exterior Walls:
 - 1. Zinc coated or cast iron pipe.
 - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- C. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- D. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
 - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.
- F. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
 - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

- A. Modular Mechanical Sleeve-Seal:
 - 1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
 - 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
 - 3. Size and select seal component materials in accordance with service requirements.
 - 4. Service Requirements:
 - a. Corrosion resistant.
 - b. Underground, buried, and wet conditions.
 - 5. Glass-reinforced plastic pressure end plates.
- B. Pipe Sleeve Material:
 - 1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
 - 2. Masonry Structures: Sheet metal or fiber.
- C. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- E. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- F. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
- G. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
- H. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 3. Locate piping in center of sleeve or penetration.
 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 5. Tighten bolting for a water-tight seal.
 6. Install in accordance with manufacturer's recommendations.
- I. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Angle valves.
- B. Ball valves.
- C. Check valves.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.
- C. Section 220553 - Identification for Plumbing Piping and Equipment.
- D. Section 220719 - Plumbing Piping Insulation.
- E. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. API STD 594 - Check Valves: Flanged, Lug, Wafer, and Butt-Welding; 2022.
- B. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022.
- F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- G. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.
- H. ASME B31.9 - Building Services Piping; 2020.
- I. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- J. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- K. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

- L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- M. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- N. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 016000 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.

1.07 Exercise the following precautions for handling:

- A. Handle large valves with sling, modified to avoid damage to exposed parts.
- B. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- B. Provide the following valves for the applications if not indicated on drawings:
 - 1. Shutoff: Ball, butterfly, _____.
- C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- D. Required Valve End Connections for Non-Wafer Types:
 - 1. Steel Pipe:
 - a. 2 inch (50 mm, DN) and Smaller: Threaded ends.
 - 2. Copper Tube:
 - a. 2 inch (50 mm, DN) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
- E. Domestic, Hot and Cold Water Valves:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Bronze: Provide with solder-joint ends.
 - b. Ball: Two piece, full port, brass with brass trim.
 - c. Bronze Swing Check: Class 125, bronze disc.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Handwheel: Valves other than quarter-turn types.
 - 2. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller _____.
- D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:
 - 1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 2. Butterfly Valves: Extended neck.
- E. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Solder-joint Connections: ASME B16.18.

3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:

1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, ANGLE VALVES

A. Class 125; CWP Rating: 200 psi (1380 kPa):

1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. End Connections: Pipe thread.
4. Stem: Bronze.
5. Disc: Bronze.
6. Packing: Asbestos free.
7. Handwheel: Bronze or aluminum.

2.04 BRONZE, BALL VALVES

A. General:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze Trim:

1. Comply with MSS SP-110.
2. WSP Rating: 150 psi (1035 kPa).
3. WOG Rating: 600 psi (4140 kPa).
4. Body: Forged bronze or dezincified-brass alloy.
5. Ends Connections: Pipe thread or solder.
6. Seats: PTFE.

2.05 BRONZE, SWING CHECK VALVES

A. General:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:

1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WOG Rating: 200 psi (1380 kPa).
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded.
6. Disc: Bronze.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Install check valves where necessary to maintain direction of flow as follows:
 - 1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

- 1.01 Section Includes
- A. Strut systems for pipe or equipment support.
 - B. Beam clamps.
 - C. Pipe hangers.
 - D. Pipe supports, guides, shields, and saddles.
 - E. Anchors and fasteners.
- 1.02 Related Requirements
- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
 - B. Section 055000 - Metal Fabrications.
- 1.03 Reference Standards
- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
 - B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
 - C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2022.
 - D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
 - E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
 - F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
 - G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
 - H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
 - I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability,

and Ultra-High Strength; 2018a.

- J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.
- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- N. UL (DIR) - Online Certifications Directory; Current Edition.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 Administrative Requirements

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 Submittals

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 Quality Assurance

- A. Comply with applicable building code.

1.07 Delivery, Storage, and Handling

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 General Requirements

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Materials for Metal Fabricated Supports: Comply with Section 055000.
 - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
 - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.02 Strut Systems for Pipe or Equipment Support

- A. Strut Channels:
 - 1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
 - 2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:
 - 1. Threaded zinc-plated steel unless otherwise indicated.
- C. Channel Nuts:
 - 1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.
- D. Cable Hanging System Kits:
 - 1. Provide cable-wire in bulk or pre-cut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).

2.03 Beam Clamps

- A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

- B. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
- C. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- D. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.04 Pipe Hangers

- A. Band Hangers, Adjustable:
 - 1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
- B. Nonmetallic Pipe Hangers:
 - 1. CPVC fabricated, snap-action hanger for pendant or sidewall applications.

2.05 Pipe Clamps

- A. Riser Clamps:
 - 1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
 - 2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
 - 3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

2.06 Pipe Supports, Guides, Shields, and Saddles

- A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- B. U-Bolts:
 - 1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.
- C. Pipe Supports:
 - 1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
 - 2. Liquid Temperatures Up to 122 degrees F (50 degrees C):
 - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
 - b. Support From Below: MSS SP-58 types 35 through 38.
- D. Pipe Supports, Thermal Insulated:
 - 1. General Requirements:
 - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
 - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.

- c. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
 - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
2. PVC Jacket:
- a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
 - b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - c. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

2.07 Anchors and Fasteners

- A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- D. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - 1. Channel Material: Use galvanized steel.
 - 2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 Examination

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 Installation

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

END OF SECTION

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tags.
- B. Pipe markers.
- C. Underground warning tape.
- D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Identification painting.
- B. Section 226000 - Gas and Vacuum Systems for Laboratory and Healthcare Facilities: Supply of pipe labels for placement under this section.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Schedules:
 - 1. Submit plumbing component identification schedule listing equipment, piping, and valves.
 - 2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
 - 3. Valve Data Format: Include id-number, location, function, and model number.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- D. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Tags:

1. Piping: 3/4 inch (20 mm) diameter and smaller.
2. Manual operated and automated control valves.
3. Instrumentation, relays, gauges, and other related control equipment products.
4. Ceiling tacks placed on lay-in ceiling surface to reference plumbing components.

B. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.02 TAGS

- A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.
- B. Piping: 3/4 inch (20 mm) diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

2.03 PIPE MARKERS

- A. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- B. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.
- C. Identification Scheme, ASME A13.1:
 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 - a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.
 - b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
 - c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.
 2. Secondary: Color scheme per fluid service.
 - a. Compressed Air: White text on blue background.
 - b. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.
 3. Tertiary: Other Details.
 - a. Directional flow arrow.

2.04 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 1. Brady Corporation: www.bradyid.com/#sle.
 2. Brimar Industries, Inc: www.brimar.com/#sle.
 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 4. Seton Identification Products: www.seton.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.

- B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil, 0.005 inch (0.12 mm), unless otherwise required for proper detection.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:

2.05 CEILING TACKS

- A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- B. Color code as follows:
 - 1. Plumbing Equipment: Yellow.
 - 2. Plumbing Valves: Green.
 - 3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping
- C. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.
- D. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- E. Apply ASME A13.1 Pipe Marking Rules:
 - 1. Place pipe marker adjacent to changes in direction.
 - 2. Place pipe marker adjacent each valve port and flange end.
 - 3. Place pipe marker at both sides of floor and wall penetrations.
 - 4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.
- F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cellular glass insulation.
- B. Flexible elastomeric cellular insulation.
- C. Glass fiber insulation.
- D. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 099113 - Exterior Painting: Painting insulation jacket.
- C. Section 099123 - Interior Painting: Painting insulation jacket.
- D. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- D. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- F. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

- I. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
 - 1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
 - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).

- C. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 CELLULAR GLASS INSULATION

- A. Insulation: ASTM C552, Type II, Grade 6.
 - 1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
 - 2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).
 - 3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/(Pa s m)) maximum per inch.
 - 4. Water Absorption: 0.5 percent by volume, maximum.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 - 3. Connection: Waterproof vapor barrier adhesive.
- B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
- C. Weather Barrier: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

2.05 JACKETING AND ACCESSORIES

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
- B. Reinforced Tape:
 - 1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
 - 2. Comply with UL 723 or ASTM E84.
 - 3. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

3.03 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Supply:
 - a. Cellular Melamine Foam Insulation:
 - 1) Pipe Size Range: 1 inch and under
 - 2) Thickness: 1.5 inches
 - b. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1 inch and under
 - 2) Thickness: 1.5 inches
 - c. Cellular Foam Insulation:
 - 1) Pipe Size Range: 1 inch and under
 - 2) Thickness: 1.5 inches
 - 2. Domestic Cold Water:
 - a. Cellular Melamine Foam Insulation:
 - 1) Pipe Size Range: 1 inch and under
 - 2) Thickness: 1.5 inches
 - b. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1 inch and under

- 2) Thickness: 1.5 inches
- c. Cellular Foam Insulation:
 - 1) Pipe Size Range: 1 inch and under
 - 2) Thickness: 1.5 inches

END OF SECTION

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
- B. Sanitary waste piping, above grade.
- C. Chemical-resistant sanitary waste piping.
- D. Domestic water piping, above grade.
- E. Natural gas piping, above grade.
- F. Vacuum piping, above grade.
- G. Pipe hangers and supports.
- H. Ball valves.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.
- C. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- D. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.
- E. Section 220553 - Identification for Plumbing Piping and Equipment.
- F. Section 220719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2019.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- E. ASME B31.1 - Power Piping; 2022.
- F. ASME B31.3 - Process Piping; 2022.

- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- H. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.
- I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023.
- J. ASTM B32 - Standard Specification for Solder Metal; 2020.
- K. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- M. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- N. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- O. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- P. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.
- Q. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.
- R. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2021.
- S. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2017.
- T. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2019.
- U. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.
- V. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2023.
- W. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.
- X. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).
- Y. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- Z. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

- AA. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.
- BB. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2015.
- CC. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- DD. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- EE. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- FF. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- GG. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- HH. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 standard weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.04 CHEMICAL-RESISTANT SANITARY WASTE PIPING

- A. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
 - 1. Manufacturers:
 - a. IPEX USA, LLC; Xirtec CPVC Schedule 40: www.ipexna.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
 - 3. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper, solder.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.06 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel threaded type.
 - 2. Joints: Threaded to ASME B31.1.
- B. Flexible Gas Piping:
 - 1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.

2. Comply with ASTM E84.
3. Fittings: Provided by piping system manufacturer.
4. Manufacturers:
 - a. Omega Flex, Inc; TracPipe CounterStrike: www.omegaflex.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.07 VACUUM PIPING, ABOVE GRADE

- A. Aluminum Tube: ASME B31.3, 6063 alloy, T5 temper.
 1. Maximum Working Pressure: 230 psi (1585 kPa).
 2. Fittings and Joints 2-1/2 inch (65 mm, DN) and Smaller:
 - a. Fittings: Comply with ASME B31.1 and ASME B31.3, aluminum or iron.
 - b. Joints: Mechanical compression, coupling, push-connect bite ring coupling with stainless steel clamping washer, or threading.
 - c. Gasket Material: High nitrile rubber seal suitable for operating temperature range from minus 4 to 176 degrees F (minus 20 to 80 degrees C).

2.08 PIPE HANGERS AND SUPPORTS

- A. See Section 220529 for additional requirements.
- B. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
- C. Plumbing Piping - Drain, Waste, and Vent:
 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
 3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
 4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- D. Plumbing Piping - Water:
 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 2. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
 3. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.

4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.

2.09 BALL VALVES

- A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

3.04 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
 - 1. Perform hydrostatic testing for leakage prior to system disinfection.
 - 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
 - 3. General:
 - a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).
- C. Gas Distribution Systems:
 - 1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
 - 2. General Systems:
 - a. Inject a minimum of 10 psi (68.9 kPa) of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
 - b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound (0.45 kg).
- D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.06 SCHEDULES

- A. Pipe Hanger Spacing:

1. Metal Piping:
 - a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
 - c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
 - d. Pipe Size: 4 inch (100 mm, DN) to 6 inch (150 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 5/8 inch (15 mm).
2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft (1.8 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleanouts.
- B. Backflow preventers.
- C. Water hammer arrestors.
- D. Mixing valves.
- E. Floor drain trap seals.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- B. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- C. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- D. Operation Data: Indicate frequency of treatment required for interceptors.
- E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 CLEANOUTS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
 - 2. Josam Company: www.josam.com/#sle.
 - 3. MIFAB, Inc; C1100-R: www.mifab.com/#sle.
 - 4. Zurn Industries, LLC: www.zurn.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Cleanouts at Interior Finished Wall Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- C. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.03 WATER HAMMER ARRESTORS

- A. Manufacturers:
 - 1. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
 - 2. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
 - 3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
 - 4. Zurn Industries, LLC: www.zurn.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Water Hammer Arrestors:
 - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.04 MIXING VALVES

- A. Thermostatic Mixing Valves:
 - 1. Manufacturers:
 - a. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
 - b. ESBE: www.esbe.se/en.
 - c. Honeywell International Inc: www.honeywellhome.com/#sle.
 - d. Leonard Valve Company: www.leonardvalve.com/#sle.

- e. Substitutions: See Section 016000 - Product Requirements.
- 2. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

2.05 HUB OUTLET TRAP SEALS

- A. Manufacturers:
 - 1. Green Drains: www.greendrains.com/#sle.
 - 2. MIFAB, Inc: www.mifab.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- D. Pipe relief from backflow preventer to nearest drain.
- E. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to hand washing sinks.

END OF SECTION

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sinks.
- B. Emergency eye and face wash.

1.02 RELATED REQUIREMENTS

- A. Section 064100 - Architectural Wood Casework: Counters for sinks and lavatories.
- B. Section 079200 - Joint Sealants: Sealing joints between fixtures and walls and floors.
- C. Section 115300 - Laboratory Equipment: Laboratory sinks.
- D. Section 123600 - Countertops: Counters for sinks and lavatories.
- E. Section 221005 - Plumbing Piping.
- F. Section 221006 - Plumbing Piping Specialties.

1.03 REFERENCE STANDARDS

- A. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.
- B. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- C. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- D. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on-site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Maximum Fixture or Faucet Supply Pressure: 60 psi (4.1 bar) unless stated otherwise.

2.02 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Perform work in accordance with local health department regulations.
- C. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 SINKS

- A. Single Compartment Bowl (SK-1)
 - 1. ASME A112.19.3; 30 x 15 x 6 inch bowl dimensions 20 gauge, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 - 2. Drain: 2 inch stainless steel.
- B. Floor-Mount Sink (SK-2)
 - 1. ASME A112.19.3; 17 x 14 x 7 inch bowl dimensions 18 gauge, 0.048 inch (1.22 mm) thick, Type 304 stainless steel. Rectangular Basin with splash lip
 - 2. Drain: 2 inch stainless steel.

3. Integral foot pedal for hands-free operation. Foot controlled self-closing valve, gooseneck faucet, manual mixing valve, supporting tube, spud and strainer, operating mechanism, foot levers and rail, combination stop, strainer and check valves.

2.04 EMERGENCY EYE WASH

- A. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
 1. Manufacturers:
 - a. Acorn Controls: www.acorneng.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.

3.08 SCHEDULES

- A. Fixture Rough-In
 - 1. Sink:
 - a. Hot Water: 3/4 Inch (22 mm).
 - b. Cold Water: 3/4 Inch (22 mm).
 - c. Waste: 2 Inch (55 mm).
 - d. Vent: 1-1/2 Inch (40 mm).

END OF SECTION

SECTION 226000
GAS AND VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings.
- B. Valves and regulators.
- C. Piping accessories.

1.02 RELATED REQUIREMENTS

- A. Section 220553 - Identification for Plumbing Piping and Equipment.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012100 - Allowances for cash allowances affecting this section.
- B. Allowance includes purchase and delivery of bottled gases. Installation is not included in the allowance but is specified in this section and is part of the Contract Sum/Price.

1.04 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- C. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- D. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- E. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- F. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- H. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
- I. NFPA 99 - Health Care Facilities Code; 2021, with Amendment.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide manufacturers literature and illustrations for all components indicating size, dimensions and configuration.
- C. Manufacturer's Instructions: Indicate installation requirements for equipment and systems.
- D. Manufacturer's Field Reports: Indicate systems are complete, zone valves installed, and alarm systems functional.
- E. Operation Data: Include installation instructions, assembly views, lubrication instructions, and assembly views.
- F. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- H. Project Record Documents: Record actual locations of piping, valving, and outlets.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.
 - 2. Extra Valves: One of each type and size.

1.06 QUALITY ASSURANCE

- A. Select products and execute work in compliance with NFPA 99 and ICC (IPC).
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least three years of documented experience.
- C. Comply with applicable codes for medical gas systems.
- D. Provide certificate of compliance from authorities having jurisdiction, indicating approval of systems.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for _____.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. Factory Preparation: Wash inside of copper pipe and copper fitting with hot solution of sodium carbonate or trisodium phosphate mixed 1 lb to 3 gal (1 kg to 25 L) of water; rinse with water, and blow dry with oil-free dry nitrogen or compressed air.
- B. Oxygen, Compressed Air, Nitrous Oxide, Nitrogen Systems, Aboveground:
 - 1. Copper Tube: Listed, ASTM B88 (ASTM B88M), Type K (A), annealed.

- a. Fittings: ASME B16.18 cast copper or ASME B16.22 wrought copper.
- b. Joints: Compression connection or AWS A5.8M/A5.8, BCuP silver braze.
- c. Mechanical Press Sealed Fittings: Double-pressed type and approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

C. Vacuum and Anesthesia Gas Evacuation Systems, Aboveground:

- 1. Copper Tube: Listed, ASTM B88 (ASTM B88M), Type K (A), annealed.
 - a. Fittings: ASME B16.18 cast copper or ASME B16.22 wrought copper.
 - b. Joints: Compression connection or AWS A5.8M/A5.8, BCuP silver braze.
 - c. Mechanical Press Sealed Fittings: Double-pressed type and approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.02 VALVES AND REGULATORS

A. Gate Valves (Vacuum, Medical Air, and Anesthesia Gas Evacuation System):

- 1. MSS SP-80; Class 150 bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

2.03 PIPING ACCESSORIES

- A. Hangers and Supports: MSS SP-58 with types as required.
- B. Flexible Connectors: Corrugated flexible, single ply, seamless or seam-welded tubing of stainless steel or bronze or reinforced teflon bellows or hose.
- C. Piping Identification: Pressure sensitive adhesive tape and decals, color and labeling to comply with Section 220553.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NFPA 99 applying system specific piping service font and tag colors.
- B. Pre-Installation Cleaning: Disassemble positive pressure gas systems pipe, fittings, valves, and components, except those supplied cleaned and prepared for intended service, and thoroughly wash in hot solution of sodium carbonate or trisodium phosphate mixed 1 lb to 3 gal (1 kg to 25 L) of water. After washing, rinse with water, dry and cap until installation.
- C. Braze joints in pipe and tubing. Avoid leaving excess flux inside of pipe and fittings. During brazing of pipe connections, purge interior of pipe continuously with nitrogen.
- D. Effect changes in size with reducing fittings. Make changes in direction of required turns or offsets with fittings or tubing shaped by bending tools. Make bends free of flattening, buckling or thinning of tube wall.
- E. Cut pipe and tubing accurately and install without springing or forcing.
- F. Provide pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions. Finish flush at both ends. Extend 2 inches (50 mm) above finished floors. Pack space between

pipe or tubing and sleeve, and caulk.

- G. Identify piping with tape and decals. Provide piping identification code and schematic for installation under provisions of Section 220553. Install labeling on pipe at intervals of not more than 20 feet (6 m) and at least once in each room and each story traversed by pipeline.
- H. Pipe Support; Space pipe hangers horizontally by pipe size or vertically as follows:
 - 1. 1/4 inch (8 mm, DN) 5 feet (1520 mm).
 - 2. 3/8 inch (10 mm, DN) 6 feet (1830 mm).
 - 3. 1/2 inch (15 mm, DN) 6 feet (1830 mm).
 - 4. 3/4 inch (20 mm, DN) 7 feet (2130 mm).
- I. Except where indicated or in flush wall mounted cabinets, install manual shut off valves with stem vertical and accessible for operation and maintenance.

3.02 PIPING SYSTEMS CLEANING AND PRESSURE TESTING

- A. After erection of pipe and tubing but prior to installation of service outlet valves, blow systems clear of free moisture and foreign matter with nitrogen gas.
- B. Install service outlet valves; subject system to test pressure of 150 psi (1034 kPa) with nitrogen or dry compressed air. Check with soapy water. Provide 24-hour standing pressure test.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Reduce pressure in piping systems other than system under investigation to atmospheric.
- C. Test system with dry compressed air or dry nitrogen with test pressure in piping system at 50 psi (345 kPa).
- D. Check each station outlet of every piping system to determine test gas is dispensed only from outlet of system under investigation. Measure pressure with gauge attached to specific adaptor. Do not use universal adaptors.
- E. Disconnect test gas and connect proper gas to each system. Purge entire system to remove test gas. Check with analyzer suitable for gas installed.

END OF SECTION

SECTION 226600
CHEMICAL-WASTE SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single-wall piping.
- B. Joints for acid-waste systems.
- C. Traps, drains, and cleanouts.

1.02 RELATED REQUIREMENTS

- A. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.
- B. Section 220553 - Identification for Plumbing Piping and Equipment.
- C. Section 312316 - Excavation.

1.03 REFERENCE STANDARDS

- A. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.
- B. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.
- C. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Pipe, fittings, tanks, manholes, joints, and related accessories.
 - 2. Solvents and adhesives highlighting VOC content.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties with sealing plugs in ends or with end protection.
- B. Protect pipe, fittings, and seals from dirt and damage.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Warrant supplied products with appurtenances to be free from defects in material and workmanship for one year.

PART 2 PRODUCTS

2.01 SINGLE-WALL PIPE

- A. CPVC (Chlorinated Polyvinyl Chloride) Piping:
 - 1. Manufacturers:
 - a. Aetna Plastics Corp: www.aetnaplastics.com/#sle.
 - b. GF Piping Systems: www.gfps.com/#sle.
 - c. IPEX USA, LLC: www.ipexna.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
 - 2. Fabrication: ASTM F441/F441M, schedule 40 pipe and fittings with minimum cell classification of 24448.
 - 3. Join Method: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
 - 4. Sizes: 1/2 to 16 inch (15 to 450 DN in mm), schedule 40.
 - 5. Required Pipe Segment Length: 10 feet (3 m).
 - 6. Transition Fittings: Provide combinations of clamps, couplings, adapters, and gaskets; compatible with installed products and service fluids when joining different piping materials.

2.02 JOINTS FOR ACID-WASTE SYSTEMS

- A. Manufacturers:
 - 1. Asahi/America: www.asahi-america.com/#sle.
 - 2. GF Piping Systems: www.gfps.com/#sle.
 - 3. IPEX USA, LLC: www.ipexna.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Solvent-Weld Joints:
 - 1. CPVC (Chlorinated Polyvinyl Chloride): ASTM F441/F441M, solvent weld with ASTM F493 solvent cement.
- C. Dissimilar Pipe Material Joints: Provide adapters, transition fittings including combination assemblies with clamps, couplings, adapters, gaskets, threaded, flanged, socket, and others.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Review plans and details to confirm general aboveground and specific belowground location and arrangement of system piping and equipment.
- B. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Remove scale and dirt, on inside and outside, before assembly.
- B. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions beginning at low point, true to grades and alignment indicated with unbroken continuity of invert.
- B. Excavate and backfill in accordance with Section 312316.
- C. Group piping whenever practical at common elevations, especially for buried piping.
- D. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.
- E. Route piping in orderly manner and maintain gradients while running parallel and perpendicular to walls.
- F. Provide sleeves for pipes passing through partitions, walls, and floors.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
- H. Provide hangers and supports for aboveground piping according to Section 220529.
- I. Identify installed piping, equipment, and accessories as indicated in Section 220553.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.

END OF SECTION

SECTION 230130.51
HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning of HVAC duct system, equipment, and related components.

1.02 RELATED REQUIREMENTS

- A. Section 014000 - Quality Requirements: Additional requirements for testing and inspection agencies.
- B. Section 015719 - Temporary Environmental Controls.
- C. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

1.03 DEFINITIONS

- A. HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, coils, and condensate drain pans; see NADCA ACR for more details.
 - 1. Exhaust-only system is required to be cleaned.

1.04 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.
- B. NADCA ACR - The NADCA Standard for Assessment, Cleaning, and Restoration of HVAC System; 2021.
- C. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.
- D. UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Project Cleanliness Evaluation and Cleaning Plan, as specified.

- C. Project Closeout Report: Include field quality control reports, evidence of satisfactory cleaning, and documentation of items needing further repair.

1.06 QUALITY ASSURANCE

- A. Information Available to Contractor: Upon request, Owner will provide the following:
 - 1. One copy of original construction drawings of HVAC system.
- B. Cleaning Contractor Qualifications: Company specializing in the cleaning and restoration of HVAC systems as specified in this section.
 - 1. Certified by one of the following:
 - a. NADCA, National Air Duct Cleaners Association: www.nadca.com.
 - 2. Having minimum of three years documented experience.
 - 3. Employing for this project a supervisor certified as an Air Systems Cleaning Specialist by NADCA.
- C. Testing and Inspection Agency Qualifications: Experienced in inspection and testing using methods defined in NADCA ACR.

PART 2 PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.
- B. Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.
- C. Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

2.02 REPLACEMENT PRODUCTS

- A. Fibrous Glass Insulation: Provide material complying with UL 181 equivalent to existing material in quality and thickness.

2.03 SURFACE TREATMENTS

- A. Anti-Microbial Materials: EPA registered specifically for use on non-porous HVAC system surfaces and applied per manufacturer's instructions.
- B. Surface Coating for Fibrous Glass Materials: Water-based, zero VOC; flame spread index less than 25, smoke developed index less than 450, Class A, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

- A. Comply with applicable federal, state, and local requirements.
- B. Perform cleaning, inspection, and remediation in accordance with the recommendations of NADCA "Assessment, Cleaning and Restoration of HVAC Systems" (ACR) and as specified herein.
- C. Where NADCA ACR uses the terms "recommended", "highly recommended", or "ideally" in regard to a certain procedure or activity, do that unless it is clearly inapplicable to the project.
- D. Take precautions to prevent introduction of additional hazards into occupied spaces.
- E. Comply with requirements of Section 015719.
- F. Obtain Owner's approval of proposed temporary locations for large equipment.
- G. Designate a decontamination area and obtain Owner's approval.
- H. When portions of the facility are to remain occupied or in operation during cleaning activities, provide adequate controls or containment to prevent access to spaces being cleaned by unauthorized persons and provide detailed instructions to Owner as to these controls or containment.
- I. If unforeseen mold or other biological contamination is encountered, notify Architect immediately, identifying areas affected and extent and type of contamination.

3.02 EXAMINATION

- A. Prior to the commencement of any cleaning work, prepare and submit to Architect a project evaluation and plan for this project, including considerations recommended in NADCA ACR.
- B. Coordinate cleaning plan with indoor air quality control plan specified in Section 015719.
- C. Inspect the system as required to determine appropriate methods, tools, equipment, and protection.
- D. Start of cleaning work constitutes acceptance of existing conditions.
- E. When concealed spaces are later made accessible, examine and document interior conditions prior to beginning cleaning.
- F. Document all instances of mold growth, rodent droppings, other biological hazards, and damaged system components.

3.03 PREPARATION

- A. When cleaning work might adversely affect life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with

authorities having jurisdiction.

- B. Ensure that electrical components that might be adversely affected by cleaning are de-energized, locked out, and protected prior to beginning work.
- C. Prepare written report listing conditions detrimental to the performance of work.
- D. Proceed with work only after unsatisfactory conditions have been corrected.
- E. Air-Volume Control Devices: Mark the original position of dampers and other air-directional mechanical devices inside the HVAC system prior to starting cleaning.
- F. Access to Concealed Spaces: Use existing service openings and make additional service openings as required to accomplish cleaning and inspection.
 - 1. Do not cut openings in non-HVAC components without obtaining the prior approval of Owner.
 - 2. Make new openings in HVAC components in accordance with NADCA Standard 05; do not compromise the structural integrity of the system.
 - 3. Do not cut service openings into flexible duct; disconnect at ends for cleaning and inspection.
- G. Ceiling Tile: Lay-in ceiling tile may be removed to gain access to HVAC systems during the cleaning process; protect tile from damage and reinstall upon completion; replace damaged tile.

3.04 CLEANING

- A. Use any cleaning method recommended by NADCA ACR unless otherwise specified; do not use methods prohibited by NADCA ACR, or that will damage HVAC components or other work, or that will significantly alter the integrity of the system.
- B. Obtain Owner's approval before using wet cleaning methods; ensure that drainage is adequate before beginning.
- C. Ducts: Mechanically clean all portions of ducts.
- D. Hoses, Cables, and Extension Rods: Clean using suitable sanitary damp wipes at the time they are being removed or withdrawn from their normal position.
- E. Registers, Diffusers, and Grilles: When removing, take care to prevent containment exposure due to accumulated debris.
- F. Coils: Follow NADCA ACR completely including measuring static pressure drop before and after cleaning; do not remove refrigeration coils from system to clean; report coils that are permanently impacted.
- G. Fibrous Glass Material: Use HEPA vacuuming equipment, under constant negative pressure, do not permit to get wet, and do not damage surfaces; replace material damaged by cleaning operations.
- H. Existing Damaged Fibrous Glass Material: Report to Architect all evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture that cannot be remedied by cleaning or resurfacing with an acceptable insulation repair coating.

1. Remove unremediable material and clean underlying surfaces.
 2. Where surface damage can be repaired by applying a coating, do so at no extra cost to Owner.
 3. Replace unremediable material.
- I. Collect debris removed during cleaning; ensure that debris is not dispersed outside the HVAC system during the cleaning process.
- J. Store contaminated tools and equipment in polyethylene bags until cleaned in the designated decontamination area.

3.05 DUCT ACCESSORIES INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install duct-mounting access doors where access doors do not currently exist to allow for the cleaning of ducts, accessories, and terminal units as follows:
1. On both sides of duct coils.
 2. Downstream from volume dampers, turning vanes, and equipment.
 3. Adjacent to fire or smoke dampers; reset or install new fusible links.
 4. Before and after each change in direction, at maximum 50-foot (15-m) spacing.
 5. On sides of ducts where adequate clearance is available.
- D. Install the following sizes for duct-mounting, rectangular access doors:
1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
 4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 5. Body Access: 25 by 14 inches (635 by 355 mm).
 6. Body Plus Ladder Access: 25 by 17 inches (635 by 430 mm).
- E. Install the following sizes for duct-mounting, round access doors:
1. One-Hand or Inspection Access: 8 inches (200 mm) in diameter.
 2. Two-Hand Access: 10 inches (250 mm) in diameter.
 3. Head and Hand Access: 12 inches (300 mm) in diameter.
 4. Head and Shoulders Access: 18 inches (460 mm) in diameter.
 5. Body Access: 24 inches (600 mm) in diameter.
- F. Install the following sizes for duct-mounting, pressure relief access doors:
1. One-Hand or Inspection Access: 5 inches (125 mm) in diameter.
 2. Two-Hand Access: 10 inches (250 mm) in diameter.
 3. Head and Hand Access: 13 inches (330 mm) in diameter.
 4. Head and Shoulders Access: 19 inches (480 mm) in diameter.

3.06 CONNECTIONS

- A. Reconnect ducts to fans and air-handling units with existing flexible connectors after cleaning ducts and flexible connectors. Replace existing damaged and deteriorated flexible connectors.
- B. For fans developing static pressures of 5-inch wg (1250 Pa) and higher, cover replacement flexible connectors with loaded vinyl sheet held in place with metal straps.
- C. Reconnect terminal units to supply ducts with existing flexible ducts or replace damaged and deteriorated existing flexible ducts with maximum 12-inch (300-mm) lengths of new flexible duct.
- D. Reconnect existing and new flexible ducts to metal ducts.

3.07 REPAIR

- A. Repair openings cut in the ventilation system so that they do not significantly alter the airflow or adversely impact the facility's indoor air quality.
- B. At insulated ducts and components, accomplish repairs in such a manner as to achieve the equivalent thermal value.
- C. Reseal new openings in accordance with NADCA Standard 05.
- D. Reseal rigid fiber glass duct systems using closure techniques that comply with UL 181 or UL 181A.
- E. When new openings are intended to be capable of being re-opened in the future, clearly mark them and report their locations to Owner in project report documents.

3.08 FIELD QUALITY CONTROL

- A. Ensure that the following field quality control activities are completed prior to application of any treatments or coatings and prior to returning HVAC system to normal operation.
- B. Visually inspect all portions of the cleaned components; if not visibly clean as defined in NADCA ACR, re-clean and reinspect.
- C. Coils: Cleaning must restore the coil pressure drop to within 10 percent of the coil's original installed pressure drop; if original pressure drop is not known, coil will be considered clean if free of foreign matter and chemical residue based on visual inspection.
- D. Notify Architect when cleaned components are ready for inspection.
- E. When directed, re-clean components until they pass.
- F. Submit evidence that all portions of the system required to be cleaned have been cleaned satisfactorily.

3.09 ANTI-MICROBIAL TREATMENT

- A. When directed, apply anti-microbial treatment to internal surfaces.
- B. Apply anti-microbial agent after removal of surface deposits and debris.
- C. Apply anti-microbial treatments and coatings in strict accordance with the manufacturer's written recommendations and EPA registration listing.
- D. Spray coatings directly onto interior ductwork surfaces; do not "fog" into air stream.

3.10 ADJUSTING

- A. After satisfactory completion of field quality control activities, restore adjustable devices to original settings, including, but not limited to, dampers, air directional devices, valves, fuses, and circuit breakers.

3.11 WASTE MANAGEMENT

- A. Double-bag waste and debris in 6 mil, 0.006 inch (0.1524 mm) thick polyethylene plastic bags.
- B. Dispose of debris off-site in accordance with applicable federal, state and local requirements.

END OF SECTION

SECTION 230517
SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.
- B. Pipe-sleeve seals.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
- C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- D. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
 - 3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

- A. Manufacturers:
 - 1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com/#sle.
 - 2. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.
 - 3. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Sealing Compounds:
 - 1. Provide packing and sealing compound to fill pipe to sleeve thickness.
 - 2. Combined packing and seal compound is to match partition fire-resistance hourly rating.
- C. Pipe Sleeve Material:
 - 1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
 - 2. Masonry Structures: Sheet metal or fiber.
- D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Structural Considerations:
 - 1. Do not penetrate building structural members unless indicated.
- E. Provide sleeves when penetrating floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Aboveground Piping:
 - a. Pack solid using mineral fiber in compliance with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
 - 2. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
 - 3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- F. Manufactured Sleeve-Seal Systems:
 - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 - 3. Locate piping in center of sleeve or penetration.
 - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 - 5. Tighten bolting for a water-tight seal.
 - 6. Install in accordance with manufacturer's recommendations.
- G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.

- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tags.
- B. Adhesive-backed duct markers.
- C. Pipe markers.
- D. Ceiling tacks.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Terminal Units: Tags.
- B. Ductwork: Adhesive-backed duct markers.
- C. Piping: Pipe markers.
- D. Small-sized Equipment: Tags.
- E. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation: www.bradycorp.com/#sle.
 - 3. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 4. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 5. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 6. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
 - 7. Substitutions: See Section 016000 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.03 ADHESIVE-BACKED DUCT MARKERS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.
- C. Style: Individual Label.
- D. Color: Green/White.

2.04 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com/#sle.
 - 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 5. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

2.05 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install tags with corrosion resistant chain.

- B. Install plastic pipe markers in accordance with manufacturer's instructions.
- C. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
- D. Install ductwork with adhesive-backed duct markers. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- E. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.
- C. Commissioning activities.

1.02 RELATED REQUIREMENTS

- A. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.
- B. Section 230800 - Commissioning of HVAC.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- B. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to the Commissioning Authority.
2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
3. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - d. Final test report forms to be used.
 - e. Procedures for formal deficiency reports, including scope, frequency and distribution.

- B. Field Logs: Submit at least twice a week to the Commissioning Authority.
- C. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.

2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

B. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- H. Check and adjust systems approximately six months after final acceptance and submit report.

3.06 FUME HOOD TESTING (ON SITE)

- A. General: Test fume hoods as installed to assess airflow velocity, airflow visualization, and level of containment. Perform tests with static mode (set sash position) conditions. Conduct testing as outlined below for 100% of the hoods provided in the Project.
- B. Testing to be performed by firm certified by National Environmental Balancing Bureau - NEBB (FHT).
- C. Preparation: Visit the project site to confirm that construction activities related to the fume hood system(s) and equipment are complete. Review design documents and Contractor's submittals. Verify that mechanical ventilation systems serving the space are functioning and operating in the normal mode. Notify Owner in writing, if conditions exist which preclude proper fume hood testing. Starting of testing constitutes acceptance of site conditions.
- D. Testing Requirements:
 - 1. Perform the following tests, in order:
 - a. Airflow Velocity Test.
 - b. Airflow Visualization Test.
 - c. Tracer Gas Containment Test.
 - 2. Airflow Velocity Test: Comply with Section 9 of NEBB (FHT) Fume Hood Testing Standard - current edition.
 - 3. Airflow Visualization Test: Comply with Section 10 of NEBB (FHT) Fume Hood Testing Standard - current edition.
 - 4. Tracer Gas Containment Test:
 - a. Comply with Section 11 of NEBB Fume Hood Testing Standard - current edition.
 - 5. Reporting Requirements: Comply with Section 5 of NEBB (FHT) Fume Hood Testing Standard - current edition. Organize and include, at a minimum, the following information:
 - a. Report Title.
 - b. Report Certification.
 - c. Table of Contents.
 - d. Report Summary/ Remarks.

- e. Appropriate Forms.
- f. Instrument Calibration.
- g. List of Abbreviations Used.
- h. A room layout drawing for each tested item. Identify: walls; doors; fume hood(s); other present environmental enclosures (e.g. biological safety cabinet(s), laminar flow hood(s), canopy hood(s), etc.); location and airflow pattern of all air supply, return, and exhaust grilles, registers and diffusers.

3.07 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Measure air quantities at air inlets and outlets.
- C. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- D. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

3.08 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- D. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.09 COMMISSIONING

- A. See Sections 019113 - General Commissioning Requirements and 230800 for additional requirements.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Fill out Prefunctional Checklists for:
 - 1. Air side systems.
 - 2. Water side systems.
- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

- E. Re-check a random sample equivalent to 25 percent of the final TAB report data as directed by Commissioning Authority.
1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
 2. Use the same test instruments as used in the original TAB work.
 3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
 4. For purposes of re-check, failure is defined as follows:
 - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
 - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
 - c. Temperatures: Deviation of more than one degree F (0.5 degree C).
 - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
 - e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
 5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
- F. In the presence of the Commissioning Authority, verify that:
1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
 2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
 3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.10 SCOPE

- A. Test, adjust, and balance the following:
1. HVAC Pumps.
 2. Air Handling Units.
 3. Fans.
 4. Air Terminal Units.

5. Air Inlets and Outlets.

3.11 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. V-Belt Drives:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Pumps:

1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

D. Cooling Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.

12. Entering water temperature, design and actual.
 13. Leaving water temperature, design and actual.
 14. Saturated suction temperature, design and actual.
 15. Air pressure drop, design and actual.
- E. Heating Coils:
1. Identification/number.
 2. Location.
 3. Service.
 4. Manufacturer.
 5. Air flow, design and actual.
 6. Water flow, design and actual.
 7. Water pressure drop, design and actual.
 8. Entering water temperature, design and actual.
 9. Leaving water temperature, design and actual.
 10. Entering air temperature, design and actual.
 11. Leaving air temperature, design and actual.
 12. Air pressure drop, design and actual.
- F. Air Moving Equipment:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Arrangement/Class/Discharge.
 6. Air flow, specified and actual.
 7. Return air flow, specified and actual.
 8. Outside air flow, specified and actual.
 9. Total static pressure (total external), specified and actual.
 10. Inlet pressure.
 11. Discharge pressure.
 12. Sheave Make/Size/Bore.
 13. Number of Belts/Make/Size.
 14. Fan RPM.
- G. Exhaust Fans:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Air flow, specified and actual.
 6. Total static pressure (total external), specified and actual.
 7. Inlet pressure.
 8. Discharge pressure.
 9. Sheave Make/Size/Bore.
 10. Number of Belts/Make/Size.
 11. Fan RPM.

- H. Terminal Unit Data:
 - 1. Manufacturer.
 - 2. Type, constant, variable, single, dual duct.
 - 3. Identification/number.
 - 4. Location.
 - 5. Model number.
 - 6. Size.
 - 7. Minimum design air flow.
 - 8. Maximum design air flow.
 - 9. Maximum actual air flow.
 - 10. Inlet static pressure.

- I. Air Distribution Tests:
 - 1. Air terminal number.
 - 2. Room number/location.
 - 3. Terminal type.
 - 4. Terminal size.
 - 5. Area factor.
 - 6. Design velocity.
 - 7. Design air flow.
 - 8. Test (final) velocity.
 - 9. Test (final) air flow.
 - 10. Percent of design air flow.

END OF SECTION

SECTION 230713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section, documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Johns Manville: www.jm.com/#sle.
 - 2. JP Lamborn Co; Thermal Sleeve MT: www.jpflex.com/#sle.
 - 3. Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; _____: www.ocbuildingspec.com/#sle.
 - 5. _____.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 ACCESSORIES

- A. Reinforced Tape:
 - 1. Manufacturers:
 - a. Ideal Tape CO, Inc; www.idealtape.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
 - 3. Comply with UL 723 or ASTM E84.

4. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
 5. Finish: Match insulation.
- B. Plain Foil Tape:
1. Manufacturers:
 - a. Ideal Tape CO, Inc; www.idealtape.com#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Aluminum foil with pressure-sensitive adhesive on paper release liner.
- C. UL181 Tape for Rigid and Flexible Ductwork:
1. Manufacturers:
 - a. Ideal Tape Co., Inc: www.idealtape.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Comply with UL 181A for rigid ductwork.
 3. Comply with UL 181B for flexible ductwork.
 4. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.
 5. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
 6. Finish: Printed with UL Listing for identification.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jacket.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor) ((below 3 meters above finished floor)): Finish with canvas jacket sized for finish painting.

END OF SECTION

SECTION 230800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The following HVAC equipment is to be commissioned, including commissioning activities for the following specific items:
 - 1. Control system.
 - 2. Major and minor equipment items.
 - 3. Piping systems and equipment.
 - 4. Ductwork and accessories.
 - 5. Terminal units.
 - 6. Special Ventilation:
 - a. Laboratory pressurization.
 - 7. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - HVAC&R Technical Requirements for the Commissioning Process; 2007, with Errata (2012).

1.04 SUBMITTALS

- A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

- B. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

- C. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
 - 1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
 - 2. Full as-built set of control drawings.
 - 3. Full as-built sequence of operations for each piece of equipment.
 - 4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
 - a. Floor.
 - b. Room number.
 - c. Room name.
 - d. Air handler unit ID.
 - e. Reference drawing number.
 - f. Air terminal unit tag ID.
 - g. Heating and/or cooling valve tag ID.
 - h. Minimum air flow rate.
 - i. Maximum air flow rate.
 - 5. Full print out of all schedules and set points after testing and acceptance of the system.
 - 6. Full as-built print out of software program.
 - 7. Electronic copy on disk of the entire program for this facility.
 - 8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
 - 9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
 - 10. Control equipment component submittals, parts lists, etc.
 - 11. Warranty requirements.
 - 12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
 - 13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
 - a. Sequences of operation.
 - b. Control drawings.
 - c. Points lists.
 - d. Controller and/or module data.
 - e. Thermostats and timers.
 - f. Sensors and DP switches.
 - g. Valves and valve actuators.
 - h. Dampers and damper actuators.
 - i. Program setups (software program printouts).

- D. Project Record Documents: See Section 017800 for additional requirements.

1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
 2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- E. Draft Training Plan: In addition to requirements specified in Section 017900, include:
1. Follow the recommendations of ASHRAE Guideline 1.1.
 2. Control system manufacturer's recommended training.
 3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- F. Training Manuals: See Section 017900 for additional requirements.
1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.
- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
 - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 - 2. Set pump/fan to normal operating mode.
 - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 - 4. Command valve/damper open; verify position is full open and adjust output signal as required.
 - 5. Command valve/damper to a few intermediate positions.
 - 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- E. Isolation Valve or System Valve Leak Check: For valves not by coils.
 - 1. With full pressure in the system, command valve closed.
 - 2. Use an ultra-sonic flow meter to detect flow or leakage.
- F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
- D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.
- E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

- F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
 - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
 - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
 - 1. Setpoint changing features and functions.
 - 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
 - 1. That all specified functions and features are set up, debugged and fully operable.
 - 2. That scheduling features are fully functional and setup, including holidays.
 - 3. That all graphic screens and value readouts are completed.
 - 4. Correct date and time setting in central computer.
 - 5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
 - 6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
 - 7. Power failure and battery backup and power-up restart functions.
 - 8. Global commands features.
 - 9. Security and access codes.

10. Occupant over-rides (manual, telephone, key, keypad, etc.).
 11. O&M schedules and alarms.
 12. Occupancy sensors and controls.
 13. All control strategies and sequences not tested during controlled equipment testing.
- H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. See Section 017800 for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

- A. See Section 017900 for additional requirements.
- B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.
- D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned.
- E. TAB Review: Instruct Owner's personnel for minimum 16 hours, after completion of TAB, on the following:
 1. Review final TAB report, explaining the layout and meanings of each data type.
 2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
 3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
 4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
 5. Other salient information that may be useful for facility operations, relative to TAB.
- F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 - Basic Control System: Provide minimum of 8 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - a. This training may be held on-site or at the manufacturer's facility.
 - b. If held off-site, the training may occur prior to final completion of the system installation.
 - c. For off-site training, Contractor shall pay expenses of up to two attendees.
 2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 8 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
 - a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
 - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
 - c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
 - d. Every display screen, allowing time for questions.
 - e. Point database entry and modifications.
 3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of 16 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- G. Provide the services of manufacturer representatives to assist instructors where necessary.
- H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 230913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control panels.
- B. Control Valves:
 - 1. Ball valves and actuators.
 - 2. Electronic operators.
- C. HVAC&R Sensors:
 - 1. Temperature sensors.
- D. Sensors with transmitters:
 - 1. Room pressure monitor.
 - 2. Air pressure transmitters.
 - 3. Temperature transmitters.

1.02 RELATED REQUIREMENTS

- A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.
- B. Section 262726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

- A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Installer's qualification statement.

- D. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
- E. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience approved by manufacturer.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

- A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.
- B. NEMA 250, general purpose utility enclosures with enameled finished face panel.
- C. Provide common keying for all panels.

2.03 CONTROL VALVES

- A. Ball Valves and Actuators:
 - 1. Manufacturers:
 - a. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle.
 - b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.
 - c. KMC Controls: www.kmccontrols.com/#sle.
 - d. Schneider Electric: www.schneider-electric.us/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 - 2. Service: Use for brine (30 percent glycol), chilled water, hot water, or steam at 15 to 25 psig (104.4 to 172.4).

3. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail normally closed (NC).
 4. Replacements in Kind: Provide pressure-independent type.
 5. Rangeability: 500 to 1.
 6. ANSI Rating: Class 150.
 7. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
 8. Body Size:
 - a. Under 2-1/2 inches (64 mm):
 - 1) Connection: NPT.
 - 2) Materials:
 - a) Body: Brass.
 - b) Flanges: Ductile iron.
 - c) Ball: Chrome-plated brass.
 - d) Stem: Nickel-plated brass.
 - e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
 - f) Stem Seal: EPDM O-Rings.
 - g) Flow Control Disk: Thermoplastic synthetic-resin.
 - b. Service Temperature:
 - 1) Fluid Side: 0 to 284 degrees F (0 to 140 degrees C) liquid or 25 psig (172.4 kPa) steam.
 - 2) Ambient Side: From minus 4 to 122 degrees F (minus 20 to 50 degrees C).
 9. Actuator Requirements:
 - a. Assembly: Factory-mounted.
 - b. Input: 0 to 5 VDC configured for proportional control.
 - c. Accessories: Provide with valve position indicator and manual override.
- B. Electronic Operators:
1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
 2. Select operator for full shut-off at maximum pump differential pressure.

2.04 HVAC&R SENSORS

- A. Temperature Sensors:
1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
 2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F (26 degrees C).
 3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
 4. Temperature Sensing Device: Compatible with project DDC controllers.
 5. Performance Characteristics:
 - a. RTD:
 - 1) Room Sensor Accuracy: Plus/minus 0.50 degrees F (0.28 degrees C) minimum.
 - 2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F (0.28 degrees C) minimum.

- 3) All Other Accuracy: Plus/minus 0.75 degrees F (0.42 degrees C) minimum.
- 4) Range: Minus 40 degrees F (Minus 40 degrees C) through 220 degrees F (104.4 degrees C) minimum.
- b. Thermistor:
 - 1) Accuracy (All): Plus/minus 0.36 degrees F (0.20 degrees C) minimum.
 - 2) Range: Minus 25 degrees F (Minus 13 degrees C) through 122 degrees F (50 degrees C) minimum.
 - 3) Heat Dissipation Constant: 2.7 mW per degree C.
- c. Temperature Transmitter:
 - 1) Accuracy: 0.10 degree F (0.06 degrees C) minimum or plus/minus 0.20 percent of span.
- d. Sensing Range:
 - 1) Provide limited range sensors if required to sense the range expected for a respective point.
 - 2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F (minus 34.4 to 114.4 degrees).
 - 3) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
- e. Wire Resistance:
 - 1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F (0.56 degrees C) or use temperature transmitter when offset is greater than 1.0 degree F (0.56 degrees C) due to wire resistance.
 - 2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.
- f. Room Temperature Sensors:
 - 1) Construct for surface or wall box mounting.
- g. Room Temperature Sensors with Integral Digital Display:
 - 1) Provide a four button keypad with the following capabilities:
 - a) Indication of space and outdoor temperatures.
 - b) Setpoint adjustment to accommodate room setpoint.
 - c) Display and control fan operation status.
 - d) Manual occupancy override and indication of occupancy status.
 - e) Controller mode status.
 - f) Password enabled setpoint and override modes.
- h. Temperature Averaging Elements:
 - 1) Use on duct sensors for ductwork 10 sq ft (0.93 sq m) or larger.
 - 2) Use averaging elements where prone to stratification with sensor length 8 ft (2.5 m) or 16 ft (5 m).
 - 3) Provide for all mixed air and heating coil discharge sensors regardless of duct size.
 - 4) Provide for reheat coil discharge sensors for ducts equal to or larger than 11 sq inches (1 sq m).
- i. Insertion Elements:
 - 1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches (1 sq m).
 - 2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches (60 mm).

2.05 SENSORS WITH TRANSMITTERS

- A. Room Pressure Monitor:
 - 1. Manufacturers:
 - a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.
 - b. Setra Systems, Inc: www.setra.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
 - 2. Type: Externally-powered, remote differential pressure transmitter interconnected via tubing or cables to pick-up sensors located inside wall-section fitted module(s).
 - 3. Transmitter: Five percent accuracy, adjustable zero and span, 100 to 1 turndown, 0.1 percent of calibrated span linearity, 30 to 50 millisecond response time, minimum overpressure of 150 percent over highest range value, alphanumeric indicating display, wired or wireless connectivity for configuration, and terminal strip within enclosed electronic components.
 - 4. Differential Pressure Monitoring Range: 0 to 0.05 in-wc (0 to 12.4 Pa), bidirectional.
 - 5. BAS, SCADA, or other Integrated Automation System Output: Two-wire, 4 to 20 mA.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches (1500 mm) above floor. Align with lighting switches and humidistats; see Section 262726.
- C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.
- B. Provide service and maintenance of control system for one year from Date of Substantial Completion.
- C. Provide complete service of controls systems, including call backs, and submit written report of each service call.
- D. In addition to normal service calls, make minimum of ____ complete normal inspections of approximately ____ hours duration to inspect, calibrate, and adjust controls.

END OF SECTION

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible ducts.
- B. Metal ducts.

1.02 RELATED REQUIREMENTS

- A. Section 230130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.
- B. Section 230713 - Duct Insulation: External insulation and duct liner.
- C. Section 233300 - Air Duct Accessories.
- D. Section 233319 - Duct Silencers.
- E. Section 233600 - Air Terminal Units.
- F. Section 233700 - Air Outlets and Inlets: Fabric air distribution devices.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2021.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.
- H. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

1.05 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.
1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
 - a. General Exhaust Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
- B. Duct Fabrication Requirements:
1. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
 2. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 3. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.
- C. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- D. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.
- E. Duct Shape and Material in accordance with Allowed Static Pressure Range:
- F. Duct Sealing and Leakage in accordance with Static Pressure Class:
- a. Supply Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
 - b. Return and Relief Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
 2. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
 3. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
 5. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.

2.02 METAL DUCTS

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
2. Aluminum: ASTM B209/B209M, aluminum sheet, alloy 3003-H14.
3. Rectangular Double Wall Insulated: Rectangular spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
 - 1) Thickness: 1 inch (25 mm).

B. Round Metal Ducts:

C. Round Spiral Duct:

D. Connectors, Fittings, Sealants, and Miscellaneous:

1. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
 - 1) Carlisle HVAC Products; Nexus Flange Connectors with Sealant Pocket: www.carlislehvac.com/#sle.
 - 2) Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.
2. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - a. VOC Content: Not more than 250 g/L, excluding water.
 - b. For Use with Flexible Ducts: UL labeled.
 - 1) Carlisle HVAC Products; Hardcast Versa-Grip 181 Water Based Fiber Reinforced Duct Sealant: www.carlislehvac.com/#sle.
 - 2) Ductmate Industries, Inc, a DMI Company; _____: www.ductmate.com/#sle.
 - 3) H.B. Fuller Construction Products, Inc; _____: www.fosterproducts.com//#sle.
 - 4) Substitutions: See Section 016000 - Product Requirements.
3. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 FLEXIBLE DUCTS

1. UL 181, Class 1, polyethylene film supported by helically wound spring steel wire.
2. Pressure Rating: From 10 in-wc (2.50 kPa) to 5 in-wc (1.25 kPa) negative.
3. Temperature Range: Minus 20 to 250 degrees F (Minus 28 to 121 degrees C).

B. Material Requirements:

C. Rectangular Metal Duct:

- a. Insulation:
 - 1) Material: Air.
2. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
3. Round Connection System: Interlocking duct connection system per SMACNA (DCS).
4. Round spiral lock seam duct with galvanized steel outer wall.
5. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
 - a. Manufacturers:

- 1) Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
 - 2) MKT Metal Manufacturing: www.mktduct.com/#sle.
 - 3) Substitutions: See Section 016000 - Product Requirements.
- b. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
- c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
- d. Manufacturers:
- 1) Design Polymerics; DP 1010 Water Based Smooth Duct Sealant, Premium Quality: www.designpoly.com/#sle.
 - 2) Elgen Manufacturing Company, Inc; Duct Sealer: www.elgenmfg.com/#sle.
- D. Flexible Air Ducts:
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
 2. Maximum Velocity: 5,500 fpm (27.9 m/s).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Comply with safety standards NFPA 90A and NFPA 90B.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Flexible Ducts: Connect to metal ducts with draw bands.
- G. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- J. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 233300, 233600, and 233700.
- K. Duct Insulation: Provide duct insulation. See Section 230713.

3.02 CLEANING

- A. Clean thoroughly each duct system. See Section 230130.51.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct access doors.
- B. Duct test holes.
- C. Volume control dampers.

1.02 RELATED REQUIREMENTS

- A. Section 233100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2021.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, and hardware used. Include electrical characteristics and connection requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.02 DUCT TEST HOLES

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

2.03 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Single Blade Dampers:
 - 1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
 - 2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.
- B. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION

SECTION 233700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 Section Includes

- A. Diffusers:
 - 1. Perforated ceiling diffusers.
 - 2. Rectangular ceiling diffusers.
- B. Registers/grilles:
 - 1. Ceiling-mounted, exhaust and return register/grilles.

1.02 Reference Standards

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012 (Reapproved 2015).
- B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2006 (Reaffirmed 2021).

1.03 Submittals

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 Quality Assurance

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 Manufacturers

- A. Price Industries: www.price-hvac.com/#sle.
- B. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.

- C. Substitutions: See Section 016000 - Product Requirements.

2.02 Rectangular Ceiling Diffusers

- A. Type: Provide square formed adjustable and multi-louvered ceiling diffusers constructed to maintain 360 degree discharge air pattern with sectorizing baffles where indicated.
- B. Connections: Round.
- C. Frame: Provide inverted T-bar type.
- D. Fabrication: Aluminum with baked enamel finish.
- E. Color: As indicated on drawings.

2.03 Perforated Face Ceiling Diffusers

- A. Type: Perforated face with fully adjustable pattern and removable face.
- B. Frame: Inverted T-bar type.
- C. Fabrication: Steel with steel frame and baked enamel finish.
- D. Fabrication: Aluminum with baked enamel finish.
- E. Color: As indicated on drawings.

PART 3 EXECUTION

3.01 Installation

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- C. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

3.02 Protection

- A. Protect installed products until completion of project.
- B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION

SECTION 238126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air-source heat pumps.
- B. Air cooled condensing units.
- C. Indoor air handling (fan and coil) units for ductless systems.
- D. Controls.

1.02 RELATED REQUIREMENTS

- A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2019, with All Amendments and Errata.
- D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2021.
- G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Design Data: Indicate refrigerant pipe sizing.

- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- H. Project Record Documents: Record actual locations of components and connections.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and approved by manufacturer.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier Corporation: www.carrier.com/#sle.
- B. Rheem Manufacturing Company Inc: www.rheem.com/#sle.
- C. Trane Inc: www.trane.com/#sle.
- D. York International Corporation / Johnson Controls: www.york.com/#sle.
- E. Basis of Design: LG Electronics; www.lghvac.com/#sle.
- F. Substitutions: See Section 016000 - Product Requirements.

2.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
 - 2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

- B. Performance Requirements: See Schedule for all requirements.
- C. Electrical Characteristics:
 - 1. 1.04 kW.
 - 2. 208 volts, single phase, 60 Hz.
 - 3. 15 amperes maximum fuse size.
 - 4. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 260583.

2.03 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 - 2. Manufacturer: System manufacturer.

2.04 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Refrigerant: R-410A.
 - 2. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.
- B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- C. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
 - 2. Provide heat pump reversing valves.
- D. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).
- E. Mounting Pad: Concrete pad, minimum 4 inches (100 mm) square; minimum of two located under cabinet feet.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.
- D. The Contractor shall ensure that a qualified manufacturer's representative is present during the system start-up phase. The representative must be on-site to oversee the initial operation, verify that the installation meets the manufacturer's guidelines, and assist with any necessary adjustments. The representative will also provide necessary training to the operational personnel on system operations and maintenance.
- E. The manufacturer's representative shall coordinate with the Contractor to schedule the start-up activities in advance, ensuring that all equipment is properly set up, calibrated, and tested per the manufacturer's instructions.

END OF SECTION

SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 RELATED REQUIREMENTS

- A. Section 028400 - Polychlorinate Biphenyl (PCB) Remediation: Removal of equipment and materials containing substances regulated under the Federal Toxic Substances Control Act (TSCA), including but not limited to those containing PCBs and mercury.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Architect before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize

outage duration.

1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
2. Make temporary connections to maintain service in areas adjacent to work area.

- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
1. Notify Owner before partially or completely disabling system.
 2. Notify local fire service.
 3. Make notifications at least 24 hours in advance.
 4. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
1. Electrical equipment, including transformers, capacitors, and switches.
 2. Lighting ballasts.
 3. Lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent containing mercury.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring back to the source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- I. Repair adjacent construction and finishes damaged during demolition and extension work.
- J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

- A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused within the scope of work.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Armored cable.
- C. Metal-clad cable.
- D. Manufactured wiring systems.
- E. Wiring connectors.
- F. Electrical tape.
- G. Wire pulling lubricant.
- H. Cable ties.
- I. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2015).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2018.
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- I. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.
- J. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- K. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- L. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 4 - Armored Cable; Current Edition, Including All Revisions.
- O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- Q. UL 183 - Manufactured Wiring Systems; Current Edition, Including All Revisions.
- R. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- S. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- T. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- U. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- V. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.
- W. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor

sizes increased for voltage drop.

2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Owner of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.
- D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 016000 - Product Requirements, for additional provisions.
 2. Extra Manufactured Wiring Systems Cable Assemblies: One of each configuration, 6 feet (2000 mm) length.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Armored cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by Engineer.
 - b. Where not approved for use by the authority having jurisdiction.
 - c. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.
 - d. Where exposed to damage.
 - e. For damp, wet, or corrosive locations.
 - f. For isolated ground circuits.
- E. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by Owner.
 - b. Where not approved for use by the authority having jurisdiction.

- c. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.
 - d. Where exposed to damage.
 - e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
 - f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
- F. Manufactured wiring systems are permitted only as follows:
- 1. Where not otherwise restricted, may be used:
 - a. For branch circuits where concealed above accessible ceilings for lighting and in open ceiling areas for lighting.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.
 - b. For general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities, when provided with additional insulated grounding conductor for redundant grounding.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Unless approved by Owner.
 - b. Where not approved for use by the authority having jurisdiction.
 - c. Where exposed to view.
 - d. Where exposed to damage.
 - e. For damp, wet, or corrosive locations.
 - f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
- I. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- J. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air

plenums.

K. Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
 - a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
 - 1) Copper conductors size 1/0 AWG and larger..
 - b. Where aluminum conductors are substituted for copper, comply with the following:
 - 1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
 - 2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
 - 3) Provide copper equipment grounding conductor sized according to NFPA 70.
 - 4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

L. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.

M. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

N. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.

- 3) Phase C: Blue.
- 4) Neutral/Grounded: White.
- b. Equipment Ground, All Systems: Green.
- c. Isolated Ground, All Systems: Green with yellow stripe.
- d. Travelers for 3-Way and 4-Way Switching: Pink.
- e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
- f. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC
 - b. Encore Wire Corporation
 - c. General Cable Technologies Corporation; _____
 - d. Service Wire Co
 - e. Southwire Company
 - f. Substitutions: See Section 016000 - Product Requirements.
 - 2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):
 - a. Encore Wire Corporation
 - b. Southwire Company
 - c. Stabiloy, a brand of General Cable Technologies Corporation; _____
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
 - 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2 or THHN/THWN.
 - b. Installed Underground: Type XHHW-2.
 - 2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.04 ARMORED CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc

2. Encore Wire Corporation
3. Southwire Company
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN.

F. Grounding: Combination of interlocking armor and integral bonding wire.

1. Provide additional full-size integral insulated equipment grounding conductor for redundant grounding, suitable for general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities.

G. Armor: Steel, interlocked tape.

2.05 METAL-CLAD CABLE

A. Manufacturers:

1. AFC Cable Systems Inc
2. Encore Wire Corporation
3. Service Wire Co
4. Southwire Company
5. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide oversized neutral conductors where indicated or required.

G. Grounding: Full-size integral equipment grounding conductor.

1. Provide additional isolated/insulated grounding conductor where indicated or required.

H. Armor: Steel, interlocked tape.

I. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.06 MANUFACTURED WIRING SYSTEMS

- A. Description: Manufactured wiring assemblies complying with NFPA 70 Article 604, and listed and labeled as complying with UL 183.
- B. Provide components necessary to transition between manufactured wiring system and other wiring methods.
- C. Branch Circuit Cables:
 - 1. Conductor Stranding (Size 10 AWG and Smaller): Solid.
 - 2. Insulation Voltage Rating: 600 V.
 - 3. Insulation: Type THHN.
 - 4. Provide dedicated neutral conductor for each phase conductor where indicated or required.
 - 5. Grounding: Full-size integral equipment grounding conductor.
 - a. Provide additional isolated/insulated grounding conductor where indicated or required.
 - 6. Armor: Steel, interlocked tape.
- D. Connectors: Keyed and color-coded to prevent interconnection of different voltages.
- E. Fixture Leads: Type TFN insulation.

2.07 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
 - 3. Connectors for Aluminum Conductors: Use compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 3. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 - 5. Aluminum Conductors: Use compression connectors for all connections.

6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
- 2.08 ACCESSORIES
- A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.
- E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
 - 6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install aluminum conductors in accordance with NECA 104.
- E. Install armored cable (Type AC) in accordance with NECA 120.
- F. Install metal-clad cable (Type MC) in accordance with NECA 120.

- G. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system.
 2. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 3. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- J. Terminate cables using suitable fittings.
1. Armored Cable (Type AC):
 - a. Use listed fittings and anti-short, insulating bushings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
 2. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- K. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- L. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- O. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.

- 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
 - 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- Q. Insulate ends of spare conductors using vinyl insulating electrical tape.
- R. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- S. Identify conductors and cables in accordance with Section 260553.
- T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- 3.04 FIELD QUALITY CONTROL
- A. See Section 014000 - Quality Requirements, for additional requirements.
 - B. Inspect and test in accordance with NETA ATS, except Section 4.
 - C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
 - D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 5. Do not use wire, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Use wood screws.
 9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Provide required vibration isolation and/or seismic controls in accordance with Section 260548.
- H. Field-Welding (where approved by Architect): Comply with Section 055000.
- I. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- J. Conduit Support and Attachment: Also comply with Section 260533.13.
- K. Box Support and Attachment: Also comply with Section 260533.16.
- L. Interior Luminaire Support and Attachment: Also comply with Section 265100.
- M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- N. Secure fasteners according to manufacturer's recommended torque settings.

- O. Remove temporary supports.
- P. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Intermediate metal conduit (IMC).
- D. PVC-coated galvanized steel rigid metal conduit (RMC).
- E. Flexible metal conduit (FMC).
- F. Liquidtight flexible metal conduit (LFMC).
- G. Electrical metallic tubing (EMT).
- H. Rigid polyvinyl chloride (PVC) conduit.
- I. Electrical nonmetallic tubing (ENT).
- J. Liquidtight flexible nonmetallic conduit (LFNC).
- K. Reinforced thermosetting resin conduit (RTRC).
- L. Conduit fittings.
- M. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 078400 - Firestopping.
- C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260533.16 - Boxes for Electrical Systems.
- F. Section 260533.23 - Surface Raceways for Electrical Systems.
- G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

- H. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2015.
- D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2018.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
- H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
- I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.
- K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- M. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).
- N. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- Q. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- R. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- S. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- T. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

- U. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- V. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- W. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- X. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- Y. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
- Z. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Shop Drawings:
 - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 - 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
 - 6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
 - 7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

- E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- J. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- L. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit, aluminum rigid metal conduit, or reinforced thermosetting resin conduit (RTRC).
- M. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.
- N. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet (1.8 m).
- O. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
- P. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Electrical Service Conduits: Also comply with Section 262100.
- C. Communications Systems Conduits: Also comply with Section 271000.
- D. Fittings for Grounding and Bonding: Also comply with Section 260526.

- E. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- F. Provide products listed, classified, and labeled as suitable for the purpose intended.
- G. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
 - 5. Underground, Interior: 3/4 inch (21 mm) trade size.
 - 6. Underground, Exterior: 1 inch (27 mm) trade size.
- H. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 ALUMINUM RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Material: Use aluminum.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:

1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
- C. PVC-Coated Fittings:
 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use steel or malleable iron.
 5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.07 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.

2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.

2.09 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 - 4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 - 5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.11 ELECTRICAL NONMETALLIC TUBING (ENT)

- A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA TC 13 and listed and labeled as complying with UL 1653.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of ENT to be connected.
 - 2. Use solvent-welded type fittings.
 - 3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

2.12 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

- A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.13 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

- A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- B. Supports: Per manufacturer's recommendations.
- C. Fittings: Same type and manufacturer as conduit to be connected.

2.14 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- E. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- G. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.
- H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- I. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.

- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
- I. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- J. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 9. Route conduits above water and drain piping where possible.
 - 10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 11. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.

- c. Flues.
 - 12. Group parallel conduits in the same area together on a common rack.
- K. Conduit Support:
- 1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 - 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 - 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 - 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 - 8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 - 9. Use of wire for support of conduits is not permitted.
 - 10. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- L. Connections and Terminations:
- 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 - 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
 - 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 - 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- M. Penetrations:
- 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 - 4. Conceal bends for conduit risers emerging above ground.

5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

N. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches (610 mm).
 - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
2. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.

O. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

1. Secure conduits to prevent floating or movement during pouring of concrete.

P. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 033000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.

Q. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.

R. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
4. Where conduits are subject to earth movement by settlement or frost.

S. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

T. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

U. Provide grounding and bonding in accordance with Section 260526.

- V. Identify conduits in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- D. Section 260533.23 - Surface Raceways for Electrical Systems:
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262726 - Wiring Devices:
 - 1. Wall plates.
 - 2. Floor box service fittings.
 - 3. Additional requirements for locating boxes for wiring devices.
- G. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.

- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- N. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.
 - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
 - 8. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Keys for Lockable Enclosures: Two of each different key.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 12. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
 - c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
 13. Wall Plates: Comply with Section 262726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 2. Manufacturer: Same as manufacturer of floor box service fittings.

2.02 ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
 - b. Communications Systems Outlets: Comply with Section 271000.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
 - 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with

- individual noncommunicating stud cavities or protect both boxes with listed putty pads.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
 11. Locate junction and pull boxes in the following areas, unless otherwise indicated:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is set back from finished surface not more than 1/4 inch (6 mm) or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- N. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- Q. Close unused box openings.
- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

- S. Provide grounding and bonding in accordance with Section 260526.
- T. Identify boxes in accordance with Section 260553.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260533.23
SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface raceway systems.
- B. Wireways.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems.
- D. Section 260533.16 - Boxes for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262726 - Wiring Devices: Receptacles.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA PRP 5 - Installation Guidelines for Surface Nonmetallic Raceway; 2015.
- E. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.
- F. UL 5A - Nonmetallic Surface Raceways and Fittings; Current Edition, Including All Revisions.
- G. UL 111 - Outline of Investigation for Multioutlet Assemblies; Current Edition, Including All Revisions.
- H. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate rough-in locations of outlet boxes provided under Section 260533.16 and conduit provided under Section 260533.13 as required for installation of raceways provided under this section.
3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
4. Notify Owner of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install raceways until final surface finishes and painting are complete.
2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.
- C. Shop Drawings:
1. Pre-wired Surface Raceway Systems: Provide plan and elevation views including dimensioned locations of wiring devices and circuiting arrangements.
 2. Wireways: Provide dimensioned plan and elevation views including adjacent equipment with all required clearances indicated.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 RACEWAY REQUIREMENTS

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.02 SURFACE RACEWAY SYSTEMS

- A. Surface Metal Raceways: Listed and labeled as complying with UL 5.
- B. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.
- C. Multioutlet Assemblies: Listed and labeled as complying with UL 111.

2.03 WIREWAYS

- A. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.
- B. Wireway Type, Unless Otherwise Indicated:
 - 1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.
 - 2. Outdoor Locations: NEMA 250, Type 3R, painted steel with screw-cover; include provision for padlocking.
- C. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.
- D. Minimum Wireway Size: 4 by 4 inches (100 by 100 mm) unless otherwise indicated.
- E. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.04 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory test each production unit for pre-wired surface raceway systems to verify proper wiring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.
- C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Surface Nonmetallic Raceways: Install in accordance with NEMA PRP 5.
- D. Install raceways plumb and level.
- E. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.
- F. Secure and support raceways in accordance with Section 260529 at intervals complying with NFPA 70 and manufacturer's requirements.
- G. Close unused raceway openings.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Identify raceways in accordance with Section 260553.
- J. Where new wireway that is required to tie into existing wireway, match manufacturer and finish as closely as possible.
- K. Where existing wireway is being reworked to fit into new layout, take care when removing from existing wall to minimize unintended damage.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect raceways for damage and defects.
- C. Surface Raceway Systems with Integrated Devices: Test each wiring device to verify operation and proper polarity.

- D. Correct wiring deficiencies and replace damaged or defective raceways.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 PROTECTION

- A. Protect installed raceways from subsequent construction operations.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 260573 - Power System Studies: Arc flash hazard warning labels.
- C. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- D. Samples:
 - 1. Identification Nameplates: One of each type and color specified.
 - 2. Warning Signs and Labels: One of each type and legend specified.

- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - 2. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
 - 3. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
 - 4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 - 5. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
 - 6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

- a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
7. Arc Flash Hazard Warning Labels: Comply with Section 260573.
 8. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
 9. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 10. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 11. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- D. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 262726.
 2. Factory Pre-Marked Wallplates: Comply with Section 262726.
 3. Use identification label to identify fire alarm system devices.
 4. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 5. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
 6. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- E. Identification for Luminaires:
1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conductors and Cables: Legible from the point of access.
 - 8. Devices: Outside face of cover.

- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260533.13 - Conduit for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 262726 - Wiring Devices.

1.02 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Wiring Devices: As specified in Section 262726.
- C. Flexible Conduit: As specified in Section 260533.13.
- D. Wire and Cable: As specified in Section 260519.
- E. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.

- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 260923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
 - 1. Includes finish requirements for wall controls specified in this section.
- E. Section 265100 - Interior Lighting.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
 - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Field Quality Control Reports.
- D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data: Include detailed information on device programming and setup.
- F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

- A. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - 3. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 - 4. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 - 5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 6. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
 - 7. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
- B. Wall Dimmer Occupancy Sensors:
 - 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
 - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset

memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

- e. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Install lighting control relays furnished under Section 253626
- C. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
 - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

- D. Install lighting control devices in accordance with manufacturer's instructions.
- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install lighting control devices plumb and level, and held securely in place.
- G. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Identify lighting control devices in accordance with Section 260553.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Engineer.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.

3. Location: At project site.

END OF SECTION

SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.
- D. Floor box service fittings.
- E. Access floor boxes.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260533.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260583 - Wiring Connections: Cords and plugs for equipment.
- F. Section 260923 - Lighting Control Devices: Devices for automatic control of lighting,.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
 - 6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
 - 1. Wall Dimmers: Include derating information for ganged multiple devices.
- C. Samples: One for each type and color of device and wall plate specified.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data:
 - 1. Wall Dimmers: Include information on operation and setting of presets.
 - 2. GFCI Receptacles: Include information on status indicators.
- G. Project Record Documents: Record actual installed locations of wiring devices.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors, in damp or wet locations, or as otherwise required by NEC 210.8.
- D. Provide tamper resistant receptacles for receptacles installed in locations required by NEC 406.12.
- E. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- F. Provide isolated ground surge protection receptacles for receptacles serving computers.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.
- H. For flush floor boxes, use tile rings for installations in tile floors.
- I. For flush floor boxes, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- D. Isolated Ground Convenience Receptacles: Orange.
- E. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate factory marked "Emergency".
- F. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.
- G. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

2.03 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____
 - 2. Leviton Manufacturing Company, Inc; _____
 - 3. Legrand North America, Inc
 - 4. Pass & Seymour, a brand of Legrand North America, Inc; _____
 - 5. Lutron Electronics, Inc
 - 6. Eaton Corporation
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20A, 120/277V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____
 - 2. Leviton Manufacturing Company, Inc; _____
 - 3. Lutron Electronics Company, Inc; Designer Style
 - 4. Pass & Seymour, a brand of Legrand North America, Inc; _____
 - 5. Eaton Corporation
 - 6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
3. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
4. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
5. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 - b. Remote test and reset buttons not allowed, unless noted on the drawings.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

- E. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

2.05 WALL PLATES

A. Manufacturers:

1. Hubbell Incorporated; _____
2. Leviton Manufacturing Company, Inc; _____
3. Lutron Electronics Company, Inc; _____
4. Pass & Seymour, a brand of Legrand North America, Inc; _____
5. Eaton Corporation
6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

- B. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard; _____.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- F. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.
- G. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- H. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.06 FLOOR BOX SERVICE FITTINGS

- A. Manufacturers:
1. Hubbell Incorporated; _____
 2. Thomas & Betts Corporation; _____
 3. Wiremold, a brand of Legrand North America, Inc; _____
 4. Eaton Corporation
- B. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.
- C. Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:
 - a. Cover: Rectangular.
 - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 2. Single Service Flush Communications Outlets:
 - a. Cover: Rectangular.
 - b. Configuration: _____.
 - c. Voice and Data Jacks: Provided by others.
 3. Single Service Flush Furniture Feed:
 - a. Cover: Rectangular.
 - b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
 4. Dual Service Flush Combination Outlets:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).

- 2) Communications: _____.
- 3) Voice and Data Jacks: Provided by others.
- 5. Dual Service Flush Furniture Feed:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
 - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
- 6. Accessories:
 - a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
 - b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

2.07 POKE-THROUGH ASSEMBLIES

- A. Manufacturers:
 - 1. Hubbell Incorporated; _____
 - 2. Thomas & Betts Corporation; _____
 - 3. Wiremold, a brand of Legrand North America, Inc; _____
 - 4. Eaton Corporation
- B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.
- C. Above-Floor Service Fittings:
 - 1. Single Service Pedestal Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle.
 - 2. Single Service Pedestal Communications Outlets:
 - a. Configuration: One 1 inch bushed opening.
 - b. Voice and Data Jacks: Provided by others.
 - 3. Single Service Pedestal Furniture Feed:
 - a. Configuration: One 3/4 inch knockout.
 - 4. Dual Service Pedestal Combination Outlets:
 - a. Configuration:
 - 1) Power: One standard convenience duplex receptacle.
 - 2) Communications: One 1 inch bushed opening.
 - 3) Voice and Data Jacks: Provided by others.
 - b. Provide barrier to separate line and low voltage compartments.
- D. Flush Floor Service Fittings:
 - 1. Single Service Flush Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 - 2. Single Service Flush Communications Outlets:
 - a. Configuration: _____.
 - b. Voice and Data Jacks: Provided by others.

3. Single Service Flush Furniture Feed:
 - a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).
4. Dual Service Flush Combination Outlets:
 - a. Cover: Hinged door(s).
 - b. Configuration:
 - 1) Power: One standard convenience duplex receptacle(s).
 - 2) Communications: Two 1/2 inch threaded opening(s).
 - 3) Voice and Data Jacks: Provided by others.
5. Dual Service Flush Furniture Feed:
 - a. Configuration:
 - 1) Power: One 3/4 inch threaded opening(s).
 - 2) Communications: Two 1/2 inch threaded opening(s).
6. Accessories:
 - a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

2.08 ACCESS FLOOR BOXES

- A. Manufacturers:
 1. Hubbell Incorporated; _____
 2. Thomas & Betts Corporation; _____
 3. Wiremold, a brand of Legrand North America, Inc; _____
 4. Eaton Corporation
- B. Description: Metallic multi-service box suitable for mounting in access floor system specified in Section 096900.
- C. Access floor boxes with pre-wired connectors for manufactured wiring systems are permitted only where manufactured wiring systems are permitted as specified in Section 260519.
- D. Configuration:
 1. Power: Two standard convenience duplex receptacle(s).
 2. Communications: Two 1/2 inch threaded opening(s).
 3. Voice and Data Jacks: Provided by others.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.

- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that openings in access floor are in proper locations.
- I. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: As indicated on the drawings.
 - a. Wall Switches: 48 inches (1200 mm), to the center to the center of the box, above finished floor.
 - b. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate within 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Owner to obtain direction prior to proceeding with work.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

- H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
- I. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.
- J. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- K. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- L. Install wall switches with OFF position down.
- M. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.
- N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- P. Identify wiring devices in accordance with Section 260553.
- Q. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Owner.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Lamps.

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 260923 - Lighting Control Devices.
- E. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.
- E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 3. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- D. Field quality control reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
 2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
- H. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 016000 - Product Requirements except where individual luminaire types are designated with substitutions not permitted.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and

protect the lamp and distribute the light.

- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 LAMPS

- A. Lamps - General Requirements:
 - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 - 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.

- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- H. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
- I. Install accessories furnished with each luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Install lamps in each luminaire.
- L. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.

- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- D. Just prior to Substantial Completion, replace all lamps that have failed.

3.07 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION