RFB NO. 319034

CONSTRUCTION DOCUMENTS
PROJECT MANUAL

DANE COUNTY DEPARTMENT OF PUBLIC WORKS,
HIGHWAY AND TRANSPORTATION

PUBLIC WORKS ENGINEERING DIVISION
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713

REQUEST FOR BIDS NO. 319034
FOURTH FLOOR OFFICES REMODEL - SUITES 418, 419 & 425
CITY-COUNTY BUILDING
210 MARTIN LUTHER KING JR. BLVD.
MADISON, WISCONSIN

Due Date / Time: **TUESDAY, DECEMBER 17, 2019 / 2:00 P.M.**

Location: **PUBLIC WORKS OFFICE**

Performance / Payment Bond: **100% OF CONTRACT AMOUNT**

Bid Deposit: **5% OF BID AMOUNT**

FOR INFORMATION ON THIS REQUEST FOR BIDS, PLEASE CONTACT:

SCOTT CARLSON, PROJECT MANAGER
TELEPHONE NO.: 608/266-4179
FAX NO.: 608/267-1533
E-MAIL: CARLSON.SCOTT@COUNTYOFDANE.COM

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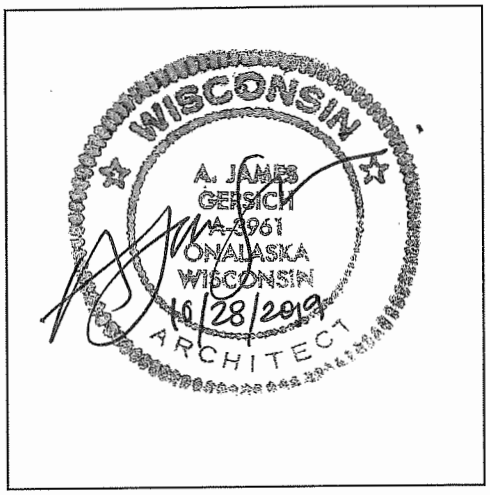
SEALS PAGE

BID NO. 319034
PROJECT: FOURTH FLOOR OFFICES REMODEL
CITY-COUNTY BUILDING

ARCHITECT
I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of Wisconsin.



A. James Gersich - Registration No. A-3961

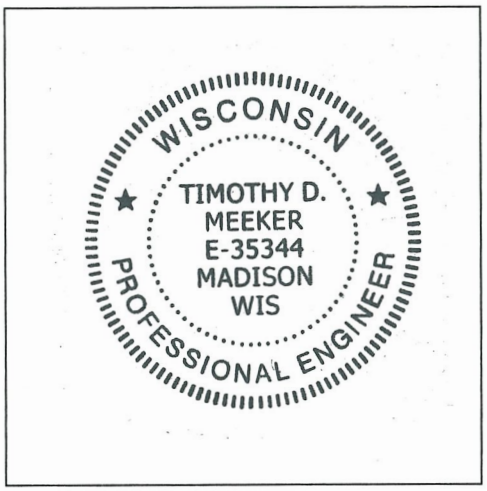
Dated: October 28, 2019

SEALS PAGE

BID NO. 319034
PROJECT: FOURTH FLOOR OFFICES REMODEL
CITY-COUNTY BUILDING

HVAC ENGINEER

I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.



Timothy D. Meeker - Registration No. E-35344

Dated: October 28, 2019

PLUMBING ENGINEER

I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Designer of Engineering Systems under the laws of the State of Wisconsin.

Christopher M. Gehrke - Registration No. D-2020

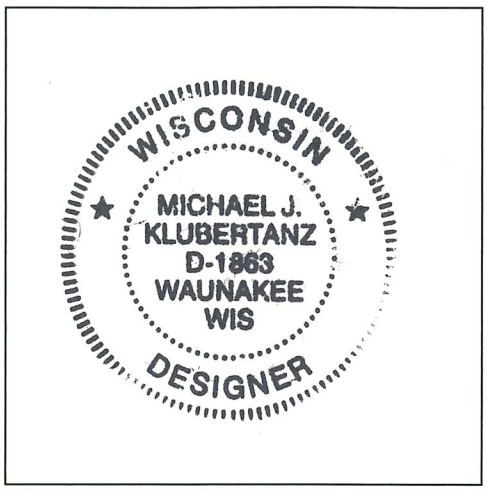
Dated: October 28, 2019

SEALS PAGE

BID NO. 319034
PROJECT: FOURTH FLOOR OFFICES REMODEL
CITY-COUNTY BUILDING

ELECTRICAL ENGINEER

I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.



Michael Klubertanz - Registration No. D-1863

Dated: October 28, 2019

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DRAWINGS

Plot drawings on 22” x 34” (ANSI D) paper for correct scale or size.

G0.0 - Cover Sheet
G0.1 - Code Compliance Plan
D1.1 - Demolition Plan - South
D1.2 - Demolition Plan - North
A1.1 - New Work Plan - South
A1.2 - New Work Plan - North
A1.3 - Wall Extension Plan
A4.1 - Reflected Ceiling Plan - South
A4.2 - Reflected Ceiling Plan - North
A6.0 - Wall Types & Details
A6.1 - Door Schedules, Door Types, Door & Frame Elevations
A7.0 - Interior Elevations
A7.1 - Interior Elevations
A8.0 - Details
A8.1 - Details
A9.1 - Floor Finish Plan - South
A9.2 - Floor Finish Plan - North
P0.0 - Symbols, Abbreviations & Details - Plumbing
P1.0 - Demolition Plan - South - Plumbing
P1.1 - Demolition Plan - North - Plumbing
P2.0 - Floor Plan - South - Plumbing
P2.1 - Floor Plan - North - Plumbing
F0.0 - Symbols, Abbreviations & Notes - Fire Protection
F1.0 - Demolition Plan - South - Fire Protection
F1.1 - Demolition Plan - North - Fire Protection
F2.0 - Floor Plan - South - Fire Protection
F2.1 - Floor Plan - North - Fire Protection
M0.0 - Symbols and Abbreviations - HVAC
M1.0 - Demolition Plan - South - HVAC Duct
M1.1 - Demolition Plan - North - HVAC Duct
M1.2 - Demolition Plan - South - HVAC Pipe
M1.3 - Demolition Plan - North - HVAC Pipe
M2.0 - Floor Plan - South - HVAC Duct
M2.1 - Floor Plan - North - HVAC Duct
M2.2 - Floor Plan - South - HVAC Pipe
M2.3 - Floor Plan - North - HVAC Pipe
M2.4 - Floor Plan - East - HVAC - Pipe
M8.0 - Schedules - HVAC
M9.0 - Details - HVAC
E0.0 - Symbols and Abbreviations - Electrical
E1.0 - Demolition Plan - South - Lighting
E1.1 - Demolition Plan - North - Lighting
E1.2 - Demolition Plan - South - Power/Systems
E1.3 - Demolition Plan - North - Power/Systems
E2.0 - Floor Plan - South - Lighting
E2.1 - Floor Plan - North - Lighting
E2.2 - Floor Plan - South - Power/Systems
E2.3 - Floor Plan - North - Power/Systems

END OF SECTION

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INVITATION TO BID

LEGAL NOTICE

Dane County Dept. of Public Works, Hwy & Transp., 1919 Alliant Energy Center Way, Madison, WI 53713, will receive sealed Bids until:

2:00 P.M., TUESDAY, DECEMBER 17, 2019

RFB NO. 319034

FOURTH FLOOR OFFICES REMODEL

CITY-COUNTY BUILDING

210 MARTIN LUTHER KING JR. BLVD., MADISON, WI

Dane County is inviting Bids for construction services for the remodeling of several office spaces. Only firms with capabilities, experience & expertise with similar projects should obtain this Request for Bids (RFB) document & submit Bids.

RFB document may be obtained after **2:00 p.m. on October 30, 2019** by downloading it from bids-pwht.countyofdane.com. Please call Scott Carlson, Project Mgr., at 608/266-4179, or our office at 608/266-4018, for any questions or additional information.

All Bidders must be pre-qualified as a Best Value Contractor before award of Contract. Complete Pre-qualification Application for Contractors at pwht.countyofdane.com/bvc_application.aspx or obtain one by calling 608/267-0119.

A pre-bid facility tour will be held Nov. 21, 2019 at 10:30 a.m. at City-County Bldg, starting in the corridor outside Suite 425. Bidders are strongly encouraged to attend this tour.

PUBLISH: OCTOBER 30 & NOVEMBER 5, 2019 - WISCONSIN STATE JOURNAL

OCTOBER 30 & NOVEMBER 5, 2019 - THE DAILY REPORTER

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INSTRUCTIONS TO BIDDERS

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1. GENERAL

A. Before submitting Bid, bidder shall thoroughly examine all Construction Documents. Successful Bidder shall be required to provide all the Work that is shown on Drawings, set forth in Specifications, or reasonably implied as necessary to complete Contract for this project.

B. Bidder shall visit site to become acquainted with adjacent areas, means of approach to site, conditions of actual site and facilities for delivering, storing, placing, and handling of materials and equipment.

C. Pre-bid meeting is scheduled on Nov. 21, 2019 at 10:30 a.m. at the City-County Building, 210 Martin Luther King Jr. Blvd., Madison, in the hall outside Suite 425. Attendance by all bidders is optional, however bidders and subcontractors are strongly encouraged to attend.

D. Failure to visit site or failure to examine any and all Construction Documents will in no way relieve successful Bidder from necessity of furnishing any necessary materials or equipment, or performing any work, that may be required to complete the Work in accordance with Drawings and Specifications. Neglect of above requirements will not be accepted as reason for delay in the Work or additional compensation.

2. DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications that form part of this Contract, as stated in Article 1 of General Conditions of Contact, are enumerated in Table of Contents of these Construction Documents.

B. Complete sets of Drawings and Specifications for all trades will be available to all Bidders, irrespective of category of work to be bid on, in order that all Bidders may be familiar with work of other trades as they affect their bid.

3. INTERPRETATION

A. No verbal explanation or instructions will be given in regard to meaning of Drawings or Specifications before Bid Due Date. Bidders shall bring inadequacies, omissions or conflicts to Owner or Architect / Engineer's attention at least ten (10) calendar days before Bid Due Date. Prompt clarification will be available to all bidders by Addendum.

B. Failure to so request clarification or interpretation of Drawings and Specifications will not relieve successful Bidder of responsibility. Signing of Contract will be considered as implicitly denoting that Contractor has thorough understanding of scope of the Work and comprehension of Construction Documents.

C. Owner or Architect / Engineer will not be responsible for verbal instructions.

4. QUALIFICATIONS OF BIDDER (CONTRACTOR AND SUBCONTRACTOR)

A. Before award of Contract can be approved, Owner shall be satisfied that Bidder involved meets following requirements:

1. Has completed at least one (1) project of at least fifty percent (50%) of size or value of Division of work being bid and type of work completed is similar to that being bid. If greater magnitude of experience is deemed necessary, other than size or value of work, such requirements will be described in appropriate section of Specifications.

2. Maintains permanent place of business.

3. Can be bonded for terms of proposed Contract.

4. Has record of satisfactorily completing past projects. Criteria which will be considered in determining satisfactory completion of projects by bidder will include:

    a. Completed contracts in accordance with drawings and specifications.
    b. Diligently pursued execution of work and completed contracts according to established time schedule unless Owner grants extensions.
    c. Fulfilled guarantee requirements of construction documents.
    d. Is not presently on ineligible list maintained by County's Department of Administration for noncompliance with equal employment opportunities and affirmative action requirements.
    e. Authorized to conduct business in Wisconsin. By submitting Bid, bidder warrants that it has: complied with all necessary requirements to do business in State of Wisconsin; that persons executing contract on its behalf are authorized to do so; and, if corporation, that name and address of bidder's registered agent are as set forth in Contract. Bidder shall notify Owner immediately, in writing, of any change in its

registered agent, their address, and bidder's legal status. For partnership, term "registered agent" shall mean general partner.

B. County's Public Works Project Manager will make such investigations as are deemed necessary to determine ability of bidder to perform the Work, and bidder shall furnish to County's Public Works Project Manager or designee all such information and data for this purpose as County's Public Works Project Manager may request. Owner reserves right to reject Bid if evidence submitted by, or investigation of, bidder fails to satisfy Owner that bidder is responsible and qualified to carry out obligations of Contract and to complete the Work contemplated therein.

5. BID GUARANTEE

A. Bank certified check, cashier's check or Bid Bond, payable to County in amount not less than five percent (5%) of maximum bid, shall accompany each Bid as guarantee that if Bid is accepted, Bidder will execute and return proposed Contract and Performance and Payment Bonds within ten (10) business days after being notified of acceptance of Bid. Company issuing bonds must be licensed to do business in Wisconsin.

B. Any bid, which is not accompanied by bid guarantee, will be considered "No Bid" and will not be read at Bid Due Date.

C. If successful Bidder so delivers Contract, Certificate of Insurance, and Performance and Payment Bonds, check will be returned to Bidder. In case Bidder fails to deliver such Contract, insurance, and bond, amount of bid guarantee will be forfeited to County as liquidated damages.

D. All checks tendered as bid guarantee, except those of three (3) lowest qualified, responsible bidders, will be returned to their makers within three (3) business days after Bid Due Date. All such retained checks will be returned immediately upon signing of Contract and Performance and Payment Bonds by successful Bidder.

6. WITHDRAWAL OF BIDS

A. Bids may be withdrawn by written request received from bidder or authorized representative thereof prior to time fixed for Bid Due Date, without prejudice to right of bidder to file new Bid. Withdrawn Bids will be returned unopened. Negligence on part of bidder in preparing their Bid confers no right for withdrawal of Bid after it has been opened.

B. No Bid may be withdrawn for period of sixty (60) calendar days after Bid Due Date.

C. If Bid contains error, omission or mistake, bidder may limit liability to amount of bidder's guarantee by giving written Notice of Intent not to execute Contract to Owner within seventy-two (72) hours of Bid Due Date.

7. CONTRACT FORM

A. Sample copy of contract that successful Bidder will be required to enter into is included in these Construction Documents and bidders are required to familiarize themselves with all conditions contained therein.

8. CONTRACT INTERESTS BY COUNTY PUBLIC OFFICIALS

A. In accordance with Wisconsin Statute 946.13, county official may not bid for or enter into any contract involving receipts or disbursements of more than $15,000.00 in a year, in which they have private pecuniary interest, direct or indirect if at same time they are authorized to take official action with respect to making of this Contract. Any contract entered into in violation of this Statute is void and County incurs no liability thereon. This subsection does not affect application and enforcement of Wisconsin Statute 946.13 by state prosecutors in criminal courts of this state.

9. EMERGING SMALL BUSINESS PROVISIONS

A. **Emerging Small Business Definition.** For purposes of this provision, ESB is defined as:

1. Independent business concern that has been in business minimum of one year;

2. Business located in State of Wisconsin;

3. Business comprised of less than twenty-five (25) employees;

4. Business must not have gross sales in excess of three million dollars ($3,000,000.00) over past three years; and

5. Business does not have history of failing to complete projects.

B. **Emerging Small Business (ESB) Involvement.** Bidder shall make good faith effort to award minimum of ten percent (10%) of the Work to ESBs. Bidder shall submit report to Dane County Contract Compliance Officer within ten (10) business days of Bid Due Date demonstrating such efforts. Good faith efforts means significant contact with ESBs for purposes of soliciting bids from them. Failure to make or demonstrate good faith efforts will be grounds for disqualification.

C. **Emerging Small Business Report.** Emerging Small Business Enterprise Report is to be submitted by Bidder in separate envelope marked “Emerging Small Business Report”. This report is due by 2:00 p.m. following specified ten (10) business days after Bid Due Date. Bidder who fails to submit Emerging Small Business Report shall be deemed not responsive.

D. **ESB Goal.** Goal of this project is ten percent (10%) ESB participation. ESB utilizations are shown as percentage of total Bid. If Bidder meets or exceeds specified goal, Bidder is only required to submit Form A - Certification, and Form B - Involvement. Goal shall be met if Bidder qualifies as ESB.

E. **Report Contents.** Following award of Contract, Bidder shall submit copies of executed contracts for all Emerging Small Businesses. Emerging Small Business Report shall consist of these:

1. Form A - Certification;

2. Form B - Involvement;

3. Form C - Contacts;

4. Form D - Certification Statement (if appropriate); and

5. Supportive documentation (i.e., copies of correspondence, telephone logs, copies of advertisements).

F. ESB Listing. Bidders may solicit bids from this ESB listing: pdf.countyofdane.com/commissions/2013-2015_Targeted_Business_Directory.pdf.

G. **ESB Certification.** All contractors, subcontractors and suppliers seeking ESB certification must complete and submit Emerging Small Business Report to Dane County Contract Compliance Program.

H. **Certification Statement.** If ESB firm has not been certified by County as ESB prior to submittal of this Bid, ESB Report cannot be used to fulfill ESB goal for this project unless firm provides "Form D - Certification Statement". Certification statement must be completed and signed by ESB firm.

I. **Questions.** Questions concerning Emerging Small Business provisions shall be directed to:

Dane County Contract Compliance Officer
City-County Building, Room 421
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
608/266-5623

J. **Substituting ESBs.** In event of any significant changes in subcontract arrangements or if need arises to substitute ESBs, Bidder shall report such proposed changes to Contract Compliance Officer to making any official changes and request authorization to substitute ESB firm. Bidder further agrees to make every possible effort to replace ESB firm with another qualified ESB firm.

K. **Good Faith Efforts.** Good faith efforts can be demonstrated by meeting all of these obligations:

1. Selecting portions of the Work to be performed by ESBs in order to increase likelihood of meeting ESB goal including, where appropriate, breaking down Contract into smaller units to facilitate ESB participation.

2. Advertising in general circulation, trade associations and women / minority focus media concerning subcontracting opportunities.

3. Providing written notices to reasonable number of specific ESBs that their interest in Contract was being solicited in sufficient time to allow ESBs to participate effectively.

4. Following up on initial solicitations of interest by contacting ESBs within five (5) business days prior to Bid Due Date to determine with certainty whether ESB were interested, to allow ESBs to prepare bids.

5. Providing interested ESB with adequate information about Drawings, Specifications and requirements of Contract.

6. Using services of available minority, women and small business organizations and other organizations that provide assistance in recruitment of MBEs / WBEs / ESBs.

7. Negotiating in good faith with interested ESBs, not rejecting ESBs as unqualified without sound reason based on thorough investigation of their capabilities.

8. Submitting required project reports and accompanying documents to County's Contract Compliance Officer within twenty-four (24) hours after Bid Due Date.

L. **Appeals Disqualification of Bid.** Bidder who is disqualified may appeal to Public Works & Transportation Committee and Equal Opportunity Commission.

10. METHOD OF AWARD - RESERVATIONS

A. Following will be basis of award of Contract, providing cost does not exceed amount of funds then estimated by County as available to finance Contract(s):

1. Lowest dollar amount submitted by qualified responsible bidder on Base Bid for all work comprising project, combined with such additive Owner accepted alternates.

2. Owner reserves right to reject all bids or any bid, to waive any informality in any bid, and to accept any bid that will best serve interests of County.

3. Unit Prices and Informational Bids will not be considered in establishing low bidder.

11. SECURITY FOR PERFORMANCE AND PAYMENTS

A. Simultaneous with delivery of signed Contract, Bidder shall be required to furnish Performance and Payment Bonds as specified in Article 29 of General Conditions of Contract, "Contract Security". Surety Company shall be licensed to do business in Wisconsin. Performance and Payment Bonds must be dated same date or subsequent to date of Contract. Performance and Payment Bonds must emulate information in Sample Performance and Payment Bonds in Construction Documents.

B. Provide certified copy of power of attorney from Surety Company showing that agent who signs Bond has power of attorney to sign for Surety Company. Secretary or Assistant Secretary of company must sign this certification, not attorney-in-fact. Certification must bear same or later date as Bond. Power of Attorney must emulate model power of attorney information detailed in Sample Performance and Payment Bonds.

C. If Bidder is partnership or joint venture, State certified list, providing names of individuals constituting partnership or joint venture must be furnished. Contract itself may be signed by one partner of partnership, or one partner of each firm comprising joint venture, but Performance and Payment Bonds must be signed by all partners.

D. If Bidder is corporation, it is necessary that current certified copy of resolution or other official act of directors of corporation be submitted showing that person who signs Contract is authorized to sign contracts for corporation. It is also necessary that corporate seal be affixed to resolution, contract, and performance and payment bonds. If your corporation has no seal, it is required that above documents include statement or notation to effect that corporation has no seal.

12. TAXES

A. Wisconsin Statute 77.54 (9m) allows building materials that become part of local unit government facilities to be exempt from sales & use tax. Vendors & materials suppliers may not charge Bidders sales & use tax on these purchases. This does not include highways,

streets or roads. Any other Sales, Consumer, Use & other similar taxes or fees required by law shall be included in Bid.

B. In accordance with Wisconsin Statute 71.80(16)(a),successful nonresident bidder, whether incorporated or not, and not otherwise regularly engaged in business in this state, shall file surety bond with State of Wisconsin Department of Revenue payable to Department of Revenue, to guarantee payment of income taxes, required unemployment compensation contributions, sales and use taxes and income taxes withheld from wages of employees, together with any penalties and interest thereon. Amount of bond shall be three percent (3%) of Contract or subcontract price on all contracts of $50,000 or more.

13. SUBMISSION OF BIDS

A. All Bids shall be submitted on standard Bid Form bound herein and only Bids that are made on this Bid Form will be considered. Entire Bid Form and other supporting documents, if any, shall be removed or copied from Construction Documents, filled out, and submitted in manner specified hereinafter. Submit completed Bid Bond with Bid as well.

B. No bids for any subdivision or any sub-classification of this Work, except as indicated, will be accepted. Any conditional Bid, amendment to Bid Form or appended item thereto, or inclusion of any correspondence, written or printed matter, or details of any nature other than that specifically called for, which would alter any essential provision of Construction Documents, or require consideration of unsolicited material or data in determining award of Contract, will disqualify Bid. Telecommunication alterations to Bid will not be accepted.

C. Bidders must submit single Bid for all the Work.

D. Bid amounts shall be inserted in words and in figures in spaces provided on Bid Form; in case of conflict, written word amounts will govern.

E. Addenda issued after Bid Letting shall become part of Construction Documents. Bidders shall acknowledge receipt of such addenda in appropriate space provided on Bid Form. Bid may be rejected if receipt of any particular addendum applicable to award of Contract has not been acknowledged on Bid Form.

F. Bids shall be signed, placed in envelope, sealed and delivered before due time to place designated in Invitation to Bid, and identified with project name, bid number, location, category of work being bid upon, Bid Due Date, name and address of bidder.

G. Bidder shall be responsible for sealed Bid being delivered to place designated for Bid Due Date on or before date and time specified. Bids received after time of closing will be rejected and returned to bidder unopened.

H. Bid will be considered invalid and will be rejected if bidder has not signed it.

I. Faxed or emailed Bids will not be accepted.

J. Bidder’s organization shall submit completed with Bid, Fair Labor Practices Certification form, included in these Construction Documents.

14. SUBCONTRACTOR LISTING

A. Bidders shall be required to submit list of major subcontractors for General Construction, Plumbing, HVAC, and Electrical work proposed for this project to include committed prices for each subcontractor. List shall be placed in separate sealed envelope that must be clearly identified as "Major Subcontractor List", for named project and name of Bidder submitting it. County must receive envelope no later than date by which successful Bidder is required to submit his or her signed Contract, as established in Construction Documents.

15. ALTERNATE BIDS

A. Not Applicable.

16. INFORMATIONAL BIDS

A. Not Applicable.

17. UNIT PRICES

A. Not Applicable.

18. COMMENCEMENT AND COMPLETION

A. Successful Bidder shall commence work when schedule and weather permit, but no later than stated in Bid Form. Contractor shall pursue the Work regularly and continuously at reasonable rate to insure completion of the Work within time stated in Bid.

B. Should it be found impossible to complete the Work on or before time specified for completion, written request may be submitted for extension of time setting forth reasons believed to justify granting of such request. Refer to Article 20 of General Conditions of Contract, titled "Time for Completion".

19. WORK BY OWNER

A. This work will be accomplished by Owner or will be let under separate contracts and will not be included under this Contract:

1. Move out & move in staff in construction areas.

2. Furnish & install switches in Contractor provided racks in Room 418B.

3. Test & removal of any asbestos containing materials that may be discovered at the site.

B. SPECIAL HAZARDS COVERAGE

A. Not Applicable.

FORM A

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CERTIFICATION

In accordance with General Conditions of Contract, submit this Emerging Small Business Report within ten (10) days after Bid Due Date.

PROJECT NAME: _____

_____

BID NO.: _____ BID DUE DATE: _____

BIDDER INFORMATION

COMPANY NAME: _____

ADDRESS: _____

_____

TELEPHONE NO.: _____

CONTACT PERSON: _____

EMAIL ADDRESS: _____

FORM B

DANE COUNTY
(Copy this Form as necessary to provide complete information)
EMERGING SMALL BUSINESS REPORT - INVOLVEMENT

COMPANY NAME: _____

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

ESB NAME: _____

CONTACT PERSON: _____

ADDRESS: _____

_____

PHONE NO & EMAIL.: _____

_____

Indicate percentage of financial commitment to this ESB: _____% Amount: $_____

ESB NAME: _____

CONTACT PERSON: _____

ADDRESS: _____

_____

PHONE NO & EMAIL.: _____

_____

Indicate percentage of financial commitment to this ESB: _____% Amount: $_____

FORM C

DANE COUNTY
(Copy this Form as necessary to provide complete information)
EMERGING SMALL BUSINESS REPORT - CONTACTS

COMPANY NAME: _____

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

	ESB FIRM NAME CONTACTED	DATE	PERSON CONTACTED	DID ESB BID?	ACC-EPT BID?	REASON FOR REJECTION
1)						
2)						
3)						
4)						
5)						
6)						
7)						
8)						

FORM D

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CERTIFICATION STATEMENT

I, _____ , _____ of
Name Title

_____ certify to best of my knowledge and
Company

belief that this business meets Emerging Small Business definition as indicated in Article 9 and that information contained in this Emerging Small Business Report is true and correct.

_____ _____
Bidder's Signature Date

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Name of Bidding Firm: _____

SECTION 00 41 13

BID FORM

BID NO. 319034
PROJECT: FOURTH FLOOR OFFICES REMODEL
CITY-COUNTY BUILDING

TO: DANE COUNTY DEPARTMENT OF PUBLIC WORKS, HIGHWAY & TRANSPORTATION PROJECT MANAGER
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713

NOTE: WISCONSIN STATUTE 77.54 (9M) ALLOWS FOR NO SALES & USE TAX ON THE PURCHASE OF MATERIALS FOR COUNTY PUBLIC WORKS PROJECTS.

BASE BID - LUMP SUM:
Dane County is inviting Bids for construction services for the remodeling of several office spaces. The undersigned, having examined the site where the Work is to be executed and having become familiar with local conditions affecting the cost of the Work and having carefully examined the Drawings and Specifications, all other Construction Documents and Addenda thereto prepared by Dane County Department of Public Works, Highway & Transportation hereby agrees to provide all labor, materials, equipment and services necessary for the complete and satisfactory execution of the entire Work, as specified in the Construction Documents, for the Base Bid stipulated sum of:

_____ and _____ /100 Dollars
Written Price

$_____
Numeric Price

Receipt of the following addenda and inclusion of their provisions in this Bid is hereby acknowledged:

Addendum No(s). _____ through _____

Dated _____

Dane County Department of Administration must have Suites 418 and 425 completed by May 29, 2020 and Suite 419 completed by September 18, 2020. Assuming this Work can be started by February 4, 2020, what dates can you commence and complete this job?

Commencement Date: _____ Completion Date: _____
(final, not substantial)

I hereby certify that all statements herein are made on behalf of:

_____

(Name of Corporation, Partnership or Person submitting Bid)

Select one of the following:

1. A corporation organized and existing under the laws of the State of _____, or

2. A partnership consisting of _____, or

3. A person conducting business as _____;

Of the City, Village, or Town of _____ of the State of _____.

I have examined and carefully prepared this Bid from the associated Construction Documents and have checked the same in detail before submitting this Bid; that I have full authority to make such statements and submit this Bid in (its) (their) (my) behalf; and that the said statements are true and correct. In signing this Bid, we also certify that we have not, either directly or indirectly, entered into any agreement or participated in any collusion or otherwise taken any action in restraint of free competition; that no attempt has been made to induce any other person or firm to submit or not to submit a Bid; that this Bid has been independently arrived at without collusion with any other bidder, competitor, or potential competitor; that this Bid has not been knowingly disclosed prior to the Bids Due Date to another bidder or competitor; that the above statement is accurate under penalty of perjury.

The undersigned agrees to be qualified as a Best Value Contractor or will have proven their exemption before Award of Contract.

The undersigned further agrees to honor the Base Bid and the Alternate Bid(s) for sixty (60) calendar days from date of Award of Contract.

SIGNATURE: _____

(Bid is invalid without signature)

Print Name: _____ Date: _____

Title: _____

Address: _____

Telephone No.: _____ Fax No.: _____

Email Address: _____

Contact Person: _____

END OF SECTION

THIS PAGE IS FOR BIDDERS' REFERENCE AND NEED NOT BE SUBMITTED WITH BID FORM.

BID CHECK LIST:
These items **must** be included with Bid:
☐ Bid Form ☐ Bid Bond ☐ Fair Labor Practices Certification

DANE COUNTY BEST VALUE CONTRACTING PRE-QUALIFICATION

General Contractors & all Subcontractors must be pre-qualified as a Best Value Contractor with the Dane County Public Works Engineering Division before the award of contract. Qualification & listing is not permanent & must be renewed every 24 months. Obtain a *Best Value Contracting Application* by calling 608/267-0119 or complete one online at:

pwht.countyofdane.com/bvc_application.aspx

DANE COUNTY VENDOR REGISTRATION PROGRAM

All bidders are strongly encouraged to be a registered vendor with Dane County. Registering allows vendors an opportunity to receive notifications for RFBs & RFPs issued by the County and provides the County with up-to-date company contact information. Complete a new form or renewal online at:

danepurchasing.com/Account/Login?

COUNTY OF DANE

PUBLIC WORKS CONSTRUCTION CONTRACT

Contract No. _____ Bid No. 319034

Authority: 2019 RES -_____

THIS CONTRACT, made and entered into as of the date by which authorized representatives of both parties have affixed their signatures, by and between the County of Dane (hereafter referred to as "COUNTY") and _____ (hereafter, "CONTRACTOR"), and

W I T N E S S E T H :

WHEREAS, COUNTY, whose address is c/o Deputy Public Works Director, 1919 Alliant Energy Center Way, Madison, WI 53713, desires to have CONTRACTOR provide office remodeling on the fourth floor of the City-County Building ("the Project"); and

WHEREAS, CONTRACTOR, whose address is _____ _____ is able and willing to construct the Project, in accordance with the Construction Documents;

NOW, THEREFORE, in consideration of the above premises and the mutual covenants of the parties hereinafter set forth, the receipt and sufficiency of which is acknowledged by each party for itself, COUNTY and CONTRACTOR do agree as follows:

1. CONTRACTOR agrees to construct, for the price of $_____ the Project and at the CONTRACTOR'S own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence labor, insurance, and other accessories and services necessary to complete the Project in accordance with the conditions and prices stated in the Bid Form, General Conditions of Contract, the drawings which include all maps, plats, plans, and other drawings and printed or written explanatory matter thereof, and the specifications therefore as prepared by Dimension IV Madison Design Group (hereinafter referred to as "the Architect / Engineer"), and as enumerated in the Project Manual Table of Contents, all of which are made a part hereof and collectively evidence and constitute the Contract.

2. COUNTY agrees to pay the CONTRACTOR in current funds for the performance of the Contract subject to additions and deductions, as provided in the General Conditions of Contract, and to make payments on account thereof as provided in Article entitled, "Payments to Contractor" of the General Conditions of Contract, Conditions of Contract.

3. During the term of this Contract, CONTRACTOR agrees to take affirmative action to ensure equal employment opportunities. The CONTRACTOR agrees in accordance with Wisconsin Statute 111.321 and Chapter 19 of the Dane County Code of Ordinances not to discriminate on the basis of age, race, ethnicity, religion, color, gender, disability, marital status, sexual orientation, national origin, cultural differences, ancestry, physical appearance, arrest record or conviction record, military participation or membership in the national guard, state defense force or any other reserve component of the military forces of the United States, or political beliefs. Such equal opportunity shall include, but not be limited to, the following: employment,

upgrading, demotion, transfer, recruitment, advertising, layoff, termination, training, rates of pay, and any other form of compensation. CONTRACTOR agrees to post in conspicuous places, available to all employees and applicants for employment, notices setting forth the provisions of this paragraph.

4. CONTRACTOR shall file an Affirmative Action Plan with the Dane County Contract Compliance Officer in accord with Chapter 19 of the Dane County Code of Ordinances. CONTRACTOR must file such plan within fifteen (15) business days of the effective date of this Contract. During the term of this Contract CONTRACTOR shall also provide copies of all announcements of employment opportunities to COUNTY'S Contract Compliance Office, and shall report annually the number of persons, by race, ethnicity, gender, and disability status, which apply for employment and, similarly classified, the number hired and number rejected.

5. During the term of this Contract, all solicitations for employment placed on CONTRACTOR'S behalf shall include a statement to the effect that CONTRACTOR is an "Equal Opportunity Employer".

6. CONTRACTOR agrees to furnish all information and reports required by COUNTY'S Contract Compliance Officer as the same relate to affirmative action and nondiscrimination, which may include any books, records, or accounts deemed appropriate to determine compliance with Chapter 19, Dane County Code of Ordinances, and the provisions of this Contract.

7. This Contract is intended to be a Contract solely between the parties hereto and for their benefit only. No part of this Contract shall be construed to add to, supplement, amend, abridge or repeal existing rights, benefits or privileges of any third party or parties including, but not limited to, employees of either of the parties.

8. The entire agreement of the parties is contained herein and this Contract supersedes any and all oral agreements and negotiations between the parties relating to the subject matter hereof. The parties expressly agree that the express terms of this Contract shall not be amended in any fashion except in writing, executed by both parties.

9. CONTRACTOR must be pre-qualified as a Best Value Contractor with Dane County Public Works Engineering Division before award of Contract. Subcontractors must be pre-qualified ten (10) business days prior to commencing Work under this Contract.

IN WITNESS WHEREOF, COUNTY and CONTRACTOR, by their respective authorized agents, have caused this Contract and its Schedules to be executed, effective as of the date by which all parties hereto have affixed their respective signatures, as indicated below.

* * * * * * *

FOR CONTRACTOR:

Signature Date

Printed or Typed Name and Title

Signature Date

Printed or Typed Name and Title

NOTE: If CONTRACTOR is a corporation, Secretary should attest. In accordance with IRS Regulations, unincorporated entities are required to provide either their Social Security or Employer Number in order to receive payment for services rendered.

* * * * * * *

This Contract is not valid or effectual for any purpose until approved by the appropriate authority designated below, and no work is authorized until the CONTRACTOR has been given notice to proceed by COUNTY'S Deputy Public Works Director.

FOR COUNTY:

Joseph T. Parisi, County Executive Date

Scott McDonell, County Clerk Date

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

BOND AMOUNT:

PROJECT:
(Name, location or address, and Project number, if any)

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of

(Witness)	*(Contractor as Principal)* *(Seal)*
	(Title)
(Witness)	*(Surety)* *(Seal)*
	(Title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

Init.
/

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	Name	Name and Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

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

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	Name	Name and Title:	

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

SECTION 00 72 13

GENERAL CONDITIONS OF CONTRACT

TABLE OF CONTENTS

1. CONSTRUCTION DOCUMENTS

A. Construction Documents, listed in Table of Contents of this Specification volume shall form part of this Contract and provisions of Construction Documents shall be as binding upon parties as if they were fully set forth in Contract itself.

B. These shall also be considered as part of Construction Documents: Addenda, including additions and modifications incorporated in such addenda before execution of Contract; requests for information; construction bulletins; change orders; and written interpretations by Architect / Engineer or Public Works Project Manager that are made after execution of Contract.

C. Construction Documents are complementary, and what is required by one shall be as binding as if required by all. Intent of Construction Documents is to include all labor, materials and equipment necessary for proper execution of the Work.

2. DEFINITIONS

A. These terms as used in this Contract are respectively defined as follows:
   1. All uses of term "County" in Construction Documents shall mean Dane County.
   2. All uses of term "Department" in Construction Documents shall mean Department of Public Works, Highway & Transportation, which is a unit of Dane County government. Department is County agency overseeing Contract with Contractor.
   3. Public Works Project Manager is appointed by and responsible to Department. Public Works Project Manager has authority to act on behalf of Department and will sign change orders, payment requests and other administrative matters related to projects.
   4. Public Works Project Manager is responsible for supervision, administration and management of field operations involved in construction phase of this Work.
   5. Term "Work" includes all labor, equipment and materials necessary to produce project required by Construction Documents.
   6. Term "Substantial Completion" is date when project or specified area of project is certified by Architect / Engineer that construction is sufficiently completed, in accordance with Construction Documents, and as modified by any subsequent changes agreed to by parties, so that County may occupy project or specified area of project for use for which it was intended subject to permit approval for occupancy.
   7. Contractor is person, firm, or corporation with whom County makes Contract. Though multiple contracts may be involved, Construction Documents treat them throughout as if each were of singular number.

3. ADDITIONAL INSTRUCTIONS AND DRAWINGS

A. Contractor may be furnished additional instructions and detail drawings as necessary to carry out the Work included in Contract. Additional drawings and instructions thus supplied to Contractor will coordinate with Construction Documents and will be so prepared that they can be reasonably interpreted as part thereof. Contractor shall carry out the Work in accordance with additional detail drawings and instructions.

4. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Unless otherwise specified, Contractor shall submit three (3) copies of all Shop Drawings for each submission, until receiving final approval. After final approval, provide five (5) additional copies for distribution and such other copies as may be required.

B. Contractor shall submit, on an on-going basis and as directed, Product Data such as brochures that shall contain catalog cuts and specifications of all furnished mechanical and electrical equipment. After Architect / Engineer's approval, one (1) copy shall remain in Architect / Engineer's file, one (1) kept at Department's office and one (1) kept at job site by Contractor for reference purposes.

C. Samples shall consist of physical examples furnished by Contractor in sufficient size and quantity to illustrate materials, equipment or workmanship, and to establish standards to compare the Work.
   1. Submit Samples in sufficient quantity (minimum of two (2)) to permit Architect / Engineer to make all necessary tests and of adequate size showing quality, type, color range, finish, and texture. Label each Sample stating material, type, color, thickness, size, project name, and Contractor's name.
   2. Submit transmittal letter requesting approval, and prepay transportation charges to Architect / Engineer's office on samples forwarded.
   3. Materials installed shall match approved Samples.

D. Contractor shall review Shop Drawings and place their dated stamp thereon to evidence their review and approval and shall submit with reasonable promptness and in orderly sequence to cause no delay in the Work or in work of any other contractor. At time of submission, Contractor shall inform Architect / Engineer in writing of any deviation in Shop Drawings or Samples from requirements of Construction Documents. Architect / Engineer will not consider partial lists.

E. Architect / Engineer will review and approve or reject Shop Drawings with reasonable promptness to cause no delay. Architect / Engineer's approval shall not relieve Contractor from responsibility for errors or omissions in Shop Drawings.

F. Contractor shall not commence any work requiring Shop Drawing, Product Data or Sample submission until Architect / Engineer has approved submission. All such work shall be in accordance with approved Shop Drawings, Product Data and Samples.

G. Contractor shall keep on site of the Work, approved or conformed copy of Shop Drawings and shall at all times give Department access thereto.

H. By stamping and submitting Shop Drawings, Product Data and Samples, Contractor thereby represents that he or she has or will determine and verify all field measurements, field construction criteria, materials, catalog numbers, and similar data and that he or she has checked and coordinated each Shop Drawing, Product Data and Sample with requirements of the Work and of Construction Documents. Architect / Engineer shall return without examination, Shop Drawings, Product Data and Samples not so noted.

I. All Shop Drawings from any one Contractor should be numbered consecutively and on cover sheet shall bear name and location of project, name of Contractor, date of submittal and date of each correction or revision and associated Specification section and page number.

5. CUTTING AND PATCHING

A. Contractor shall be responsible for all cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

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

6. CLEANING UP

A. Contractor shall keep premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under Contract. Contractor shall remove from and about the Work waste materials, rubbish, Contractor's tools, construction equipment, machinery, and surplus materials at completion of the Work. Contractor shall maintain streets and sidewalks around the Work site in clean condition. Contractor shall remove all spillage and prevent tracking of spillage arising from performance of the Work, into, out of, and within the Work site. Contractor shall establish regular maintenance program of sweeping, vacuuming and / or hosing to minimize accumulation of dirt and dust upon such areas.

B. If Contractor fails to clean up as directed in Construction Documents, County may do so and shall charge Contractor cost thereof.

C. Contractor shall be responsible for broken windows and glass, and at completion of the Work shall replace such damaged or broken windows and glass. After replacing damaged or broken windows and glass, Contractor shall remove all labels, wash and polish both sides of all windows and glass.

D. In addition to general cleaning (sweeping, vacuuming and / or hosing, as is appropriate to work surface), Contractor shall perform following final cleaning for all trades at completion of the Work:
   1. Remove temporary protections;
   2. Remove marks, stains, fingerprints and other soil or dirt from painted, decorated and finished woodwork and wall surfaces;
   3. Remove spots, plaster, soil and paint from ceramic tile, marble and other finished materials, and wash or wipe clean;
   4. Clean fixtures, cabinet work and equipment, removing stains, paint, dirt and dust, and leave same in undamaged, new condition;
   5. Clean aluminum in accordance with recommendations of manufacturer; and
   6. Clean resilient floors thoroughly with well-rinsed mop containing only enough moisture to clean off any surface dirt or dust and buff dry by machine to bring surfaces to sheen.

7. USE OF SITE

A. Contractor shall provide County and Architect / Engineer access to the Work under all circumstances.

B. Contractor shall confine operations at site to areas permitted by County, law, ordinance, permits and Construction Documents and shall not unreasonably encumber site with materials or equipment. Contractor shall assure free, convenient, unencumbered, direct and safe access to all properties adjacent to the Work for County, its employees, invitees and guests.

8. MATERIALS AND WORKMANSHIP

A. Contractor shall perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, necessary to complete the Work required by this Contract, within time specified, in accordance with provisions of Construction Documents.

B. All equipment and materials incorporated in the Work covered by this Contract are to be new; use recycled and / or recovered materials to extent that such use is technically and economically feasible. Recovered materials are products recovered from solid waste in form identical to original form for use that is same as, or similar to original use. Recycled materials are products manufactured from solid waste.

C. If requested, Contractor shall furnish satisfactory evidence as to kind and quality of construction materials proposed or used. Contractor shall furnish to Architect / Engineer, for approval, manufacturer name and model, performance capacities and other pertinent information of machinery, mechanical, electrical or other types of equipment, which Contractor plans to install.

D. If not otherwise provided, materials and labor called for in this Contract shall be provided and performed in accordance with established practice and standards recognized by Architects, Engineers, Department, and construction industry.

E. Reference to "Standard" specifications of any association or manufacturer, or codes of County authorities, intends most recent printed edition or catalog in effect on date that corresponds with date of Construction Documents.

F. Whenever reference is made in Specifications that work shall be "performed", "applied", in accordance with "manufacturer's directions or instructions", Contractor to whom those instructions are directed shall furnish three (3) printed copies of such instructions to Architect / Engineer before execution of the Work.

9. CONTRACTOR'S TITLE TO MATERIALS

A. Contractor or any subcontractor shall not purchase materials or supplies for the Work subject to any chattel mortgage or under conditional sale contract or other agreement by which seller retains interest. Contractor warrants that all materials and supplies used in the Work are free from all liens, claims or encumbrances and Contractor has good title to them.

10. "OR EQUAL" CLAUSE

A. Whenever equipment or materials are identified on Drawings or in Specifications by reference to manufacturer's or vendor's name, trade name, catalog number, and other identifying information, it is intended to establish standards; and any equipment or material of other manufacturers and vendors which will perform adequately duties imposed by

general design will be considered equally accepted provided equipment or material so proposed is, in opinion of Architect / Engineer, of equal substance and function. Architect / Engineer and Department shall provide written approval before Contractor may purchase or install it.

B. Equipment or materials of manufacturers, other than those named, may be used only upon following conditions:
   1. That, in opinion of Architect / Engineer and Department, proposed material or equipment item is fully equal or superior (in design, materials, construction, workmanship, performance, finish, etc.) to named item. No compromise in quality level, however small, is acceptable.
   2. That, in substituting materials or equipment, Contractor assumes responsibility for any changes in system or for modifications required in adjacent or related work to accommodate such substitution despite Architect / Engineer's and Department's approval, and all costs growing out of approval of "or equal" items shall be responsibility of Contractor. No extra costs resulting from such approval shall become responsibility of Department, Architect / Engineer or any other separate Contractor.
   3. It shall be understood that use of materials or equipment other than those specified, or approved equal by Architect / Engineer and Department, shall constitute violation of Contract, and that Architect / Engineer and Department shall have right to require removal of such materials or equipment and their replacement with specified materials or equipment at Contractor's expense.
   4. Product and manufacturer named first in Specifications or on information shown on Drawings is basis of selection of manufactured items and equipment, particularly mechanical equipment. In using other than first named products or manufacturers, including those specified as additionally approved or acceptable, Contractor assumes responsibility for any changes in system and for modifications in any work required to accommodate them. Architect / Engineer's approval of such additionally acceptable products or manufacturers, either in Specifications or in Addendum, does not relieve Contractor from obligation to coordinate such optional products with other Contractors, whose work may be affected by them, and to pay all additional costs resulting from their inclusion into the Work. Contractor's liability shall include payment of Architect / Engineer's fees for any additional services made necessary by or directly connected to such product changes. No extra costs resulting from such changes shall become responsibility of Department, Architect / Engineer or any other separate Contractor.

C. No request for approval of "or equal" materials will be entertained except from Contractor. Identify any request for substitution as substitution on Contractor's letter of transmittal and give reasons for substitution. Department may in its sole discretion allow substitutions of materials.

11. PATENTS AND ROYALTIES

A. If Contractor uses any design, device or material covered by letters, patent or copyright, it is mutually agreed and understood, that, without exception, contract prices shall include all royalties or costs arising from use of such design, device or materials, in any way involved in the Work.

B. Contractor shall indemnify and save harmless County from any and all claims for infringement by reason of use of such patent or copyright in connection with the Work agreed to be performed under this Contract, and shall indemnify County for any cost,

expense or damage which it may be obliged to pay by reason of such infringement at any time during prosecution of the Work or after completion of the Work.

12. SURVEYS, PERMITS, REGULATIONS AND TAXES

A. Department will furnish to Contractor all site, topography and property surveys necessary for execution of the Work.

B. Contractor shall procure all permits, licenses and approvals necessary for execution of this Contract.

C. Contractor shall give all notices and comply with all State of Wisconsin, Federal and local laws, codes, rules and regulations relating to performance of the Work, protection of adjacent property, and maintenance of passageways, guard fences or other protective facilities.

D. Contractor does not need to pay State and local sales & use taxes. See Wisconsin Statute 77.54 (9m).

E. Contractor shall promptly notify Architect / Engineer of any variances of Drawings or Specifications with that of any State of Wisconsin, federal or local law, code, rule or regulation. Upon such notification, Architect / Engineer will require correction of variance to comply with applicable law, code, rule or regulation at no additional cost to Contractor.

F. Work under this Contract shall comply with all applicable State of Wisconsin, Federal and local laws, codes and regulations.

G. Contractor shall pay charges for water, sewer and other utility connections made by municipalities where required by Specifications.

13. CONTRACTOR'S OBLIGATIONS AND SUPERINTENDENCE

A. Contractor shall provide and pay for all materials, labor, tools, equipment, transportation and superintendence necessary to execute, complete and deliver the Work within specified time. Contractor agrees to secure at their own expense all personnel necessary to carry out the Work. Such personnel shall not be deemed County employees nor shall they have or be deemed to have any direct contractual relationship with County.

B. Performance of any work necessary after regular working hours, on Sundays or Legal Holidays shall be without additional expense to County. Performance of any work at site at other than normal working hours must be coordinated with Public Works Project Manager.

C. Contractor shall furnish, erect, maintain and remove such temporary works as may be required.

D. Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitations of Construction Documents.

E. At the Work site, Contractor shall give personal superintendence to the Work or shall employ construction superintendent or foreman, experienced in character of work covered by Contract, who shall have full authority to act for Contractor. Understand that such superintendent or foreman shall be acceptable to Architect / Engineer and Department.

F. Remove from project or take other corrective action upon notice from Architect / Engineer or Department for Contractor's employees whose work is considered by Architect / Engineer or Department to be unsatisfactory, careless, incompetent, unskilled or otherwise objectionable.

G. Contractor and subcontractors shall be required to conform to Labor Laws of State of Wisconsin and various acts amendatory and supplementary thereto and to other laws, ordinances and legal requirements applicable to the Work.

H. Presence and observation of the Work by Architect / Engineer or Public Works Project Manager shall not relieve Contractor of any obligations.

14. WEATHER CONDITIONS

A. In event of temporary suspension of work, or during inclement weather, or whenever Architect / Engineer shall direct, Contractor shall, and shall cause subcontractors to protect carefully all work and materials against damage or injury from weather. If, in opinion of Architect / Engineer or Department, any work or materials that have been damaged or injured due to failure on part of Contractor or any subcontractors so to protect the Work, such materials shall be removed and replaced at expense of Contractor.

15. PROTECTION OF WORK AND PROPERTY

A. Contractor shall at all times safely guard County's property from injury or loss in connection with this Contract. Contractor shall at all times safely guard and protect the Work, and adjacent property, from damage. Contractor shall replace or make good any such damage, loss or injury unless such is caused directly by errors contained in Contract, or by County, or County's duly authorized representative.

B. Contractor may act diligently, without previous instructions from Architect / Engineer and / or Department, in emergency that threatens loss or injury of property, or safety of life. Contractor shall notify Architect / Engineer and / or Department immediately thereafter. Promptly submit any claim for compensation by Contractor due to such extra work to Architect / Engineer and / or Department for approval as provided for in Article 18 herein.

16. INSPECTION AND TESTING OF MATERIALS

A. Authorized representatives and agents of County government shall have access at all times to the Work wherever it is in preparation or progress and Contractor shall provide facilities for such access and for inspection.

B. Should it be considered necessary or advisable at any time before final acceptance of the Work to make examination of work already completed, by removing or tearing out same, Contractor shall upon request, promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any aspect, due to fault of Contractor or subcontractors thereof, Contractor shall assume all expenses of such examination and of satisfactory reconstruction. Contractor will be reimbursed for such examination and replacement in accordance with Article 18 - A.3., of these General Conditions of Contract if such work is found to meet requirements of Contract.

C. If Specifications, Architect / Engineer's, or Public Works Project Manager's instructions require any work to be specially tested or approved, Contractor shall give Architect / Engineer and Public Works Project Manager timely notice of its readiness for testing or inspection. Test all materials and equipment requiring testing in accordance with accepted or specified standards, as applicable. Architect / Engineer shall recommend laboratory or inspection agency and Department will select and pay for all initial laboratory inspection services. Should retesting be required, due to failure of initial testing, cost of such retesting shall be borne by Contractor.

D. Cost of any testing performed by manufacturers or Contractor for substantiating acceptability of proposed substitution of materials and equipment, or necessary conformance testing in conjunction with manufacturing processes or factory assemblage, shall be borne by Contractor or manufacturer responsible.

17. REPORTS, RECORDS AND DATA

A. Contractor shall submit to Architect / Engineer and Public Works Project Manager such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, invoices, records and other data as either may request concerning work performed or to be performed under this Contract.

18. CHANGES IN THE WORK

A. Make no changes, except in cases of emergency, in the Work covered by approved Construction Documents without having prior written approval of Department. Charges or credits for the Work covered by approved change shall be determined by one of these methods:
   1. Unit bid prices previously approved.
   2. Agreed lump sum based on actual cost of:
      a) Labor, including foremen, and all fringe benefits that are associated with their wages.
      b) Materials entering permanently into the Work.
      c) Ownership or rental cost of construction tools and equipment during time of use on extra work.
      d) Power and consumable supplies for operation of power equipment.
      e) Workmen's Compensation Insurance, Contractor's Public Liability and Property Damage Insurance, and Comprehensive Automobile Liability Insurance.
      f) Social Security and old age and unemployment contributions.
      g) Add to cost under (2), fixed fee to be agreed upon, but not to exceed fifteen percent (15%) of actual cost of work performed with their own labor force. Fee shall be compensation to cover cost of supervision, overhead, bond, profit and any other general expense.
      h) On that portion of the Work under (2) done under subcontract, Contractor may include not over seven and one-half percent (7½%) for supervision, overhead, bond, profit and any other general expense.
      i) Department may require correct amount of costs with supporting vouchers; Contractor shall keep and present in such form as directed.
   3. Cost-plus work, with not-to-exceed dollar limit, based on actual cost of:
      a) Labor, including foremen, and all fringe benefits that are associated with their wages.
      b) Materials entering permanently into the Work.

c) Ownership or rental cost of construction tools and equipment during time of use on extra work. Rental cost cannot exceed fifty percent (50%) replacement value of rented equipment.
d) Power and consumable supplies for operation of power equipment.
e) Workmen's Compensation Insurance, Contractor's Public Liability and Property Damage Insurance, and Comprehensive Automobile Liability Insurance.
f) Social Security and old age and unemployment contributions.
g) To cost under (3), there shall be added fixed fee to be agreed upon but not to exceed fifteen percent (15%) of actual cost of work performed with their own labor force. Fee shall be compensation to cover cost of supervision, overhead, bond, profit, and any other general expense.
h) On that portion of the Work under (3) done under subcontract, Contractor may include not over seven and one-half percent (7½%) for supervision, overhead, bond, profit, and any other general expense.
i) Contractor shall keep and present, in such form as directed, correct amount of cost together with such supporting vouchers as may be required by Department.

B. If Contractor claims that by any instructions given by Architect / Engineer, Department, by drawings or otherwise, regarding performance of the Work or furnishing of material under Contract, involves extra cost, Contractor shall give Department written notice of cost thereof within two (2) weeks after receipt of such instructions and in any event before proceeding to execute work, unless delay in executing work would endanger life or property.

C. No claim for extra work or cost shall be allowed unless it was done in pursuance of written Change Order from Architect / Engineer and approved by Department, as previously mentioned, and claim presented with payment request submitted after changed or extra work is completed.

D. Negotiation of cost for change in the Work shall not be cause for Contractor to delay prosecution of the Work if Contractor has been authorized in writing by Public Works Project Manager to proceed.

19. EXTRAS

A. Without invalidating Contract, Department may order extra work or make changes by altering, adding to or deducting from the Work, contract sum being adjusted in accordance with Article 18 herein.

20. TIME FOR COMPLETION

A. Contractor agrees that the Work shall be prosecuted regularly and diligently and complete the Work as stated in Construction Documents.

21. CORRECTION OF WORK

A. All work, all materials whether incorporated in the Work or not, and all processes of manufacture shall at all times and places be subject to inspection of Architect / Engineer and Public Works Project Manager who shall be judge of quality and suitability of the Work, materials, and processes of manufacture for purposes for which they are used. Should they fail to meet Architect / Engineer's and Public Works Project Manager's approval they shall

be reconstructed, made good, replaced or corrected, by Contractor at Contractor's expense. Immediately remove all rejected material from site.

B. If Contractor defaults or neglects to carry out the Work in accordance with Construction Documents or fails to perform any provision of Contract, Department may, after ten (10) business days' written notice to Contractor and without prejudice to any other remedy County may have, make good such deficiencies. In such case, appropriate Change Order shall be issued deducting from Contractor's payments then or thereafter, cost of correcting such deficiencies, including cost of Architect / Engineer's additional services made necessary by such default, neglect or failure.

22. SUBSURFACE CONDITIONS FOUND DIFFERENT

A. If Contractor encounters subsurface or latent conditions at site materially differing from those shown on Drawings or indicated in Specifications, Contractor shall immediately give notice to Architect / Engineer and Public Works Project Manager of such conditions before they are disturbed. Architect / Engineer will thereupon promptly investigate conditions, and if Architect / Engineer finds that they materially differ from those shown on Drawings or indicated in Specifications, Architect / Engineer will at once make such changes as necessary, any increase or decrease of cost resulting from such changes to be adjusted in manner provided in above Article 18 entitled "Changes in the Work".

23. RIGHT OF DEPARTMENT TO TERMINATE CONTRACT

A. In event that any provisions of this Contract are violated by Contractor or by any subcontractors, County may serve written notice upon Contractor and Surety of its intention to terminate Contract, such notice to contain reasons for such intention to terminate Contract, and unless within ten (10) business days after serving of such notice upon Contractor, such violation or delay shall cease and satisfactory arrangement or correction be made, Contract shall, upon expiration of said ten (10) business days, cease and terminate.

B. In event of any such termination, County shall immediately serve notice thereof upon Surety and Contractor, and Surety shall have right to take over and perform Contract subject to County's approval; provided, however, that if Surety does not commence performance thereof within ten (10) business days from date of mailing to such Surety of notice of termination, County may take over the Work and prosecute same to completion by contract, or by force account, at expense of Contractor; Contractor and Surety shall be liable to County for any excess cost occasioned County thereby, and in such event County may take possession of and utilize in completing the Work, such materials and equipment as may be on the Work site and therefore necessary.

24. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

A. Contractor shall be responsible for Construction Schedule and coordination. Immediately after execution and delivery of Contract and before making first payment, Contractor shall notify all subcontractors to furnish all required information to develop Construction Schedule. Contractor and all subcontractors associated with the Work shall furnish following information from each Division of Specifications:
   1. List of construction activities;
   2. Start, finish and time required for completion of each activity;
   3. Sequential relationships between activities;

4. Identify all long lead-time items, key events, meetings or activities such as required submittals, fabrication and delivery, procurement of materials, installation and testing;
5. Weekly definition of extent of work and areas of activity for each trade or Subcontract; and
6. Other information as determined by Public Works Project Manager.

B. In addition to above requested items, Contractor shall request delivery dates for all County-furnished equipment, materials or labor. This shall include any work handled by Department under separate contracts such as asbestos abatement, air and water balancing, etc. Indicate on Construction Schedule these associated delivery and installation dates.

C. Progress Reporting:
1. Contractor shall update and publish Construction Schedule on monthly basis. Revisions to Schedule shall be by Contractor and made in same detail as original Schedule and accompanied by explanation of reasons for revision; and shall be subject to approval by Department.
2. Failure of Contractor to keep Schedule in updated format shall result in County hiring firm specializing in construction schedule development and deducting those costs associated with updating process from payments due Contractor.
3. Contractor shall submit show actual percentage of each activity completed, estimated future progress, and anticipated completion time.

D. Responsibility for timely completion requires:
1. Contractor and subcontractors understand that performance of each is interdependent upon performance of others.
2. Whenever it becomes apparent from current schedule, that phasing or progress completion dates will not be met, Contractor must take some or all following actions at no additional cost to County:
   a) Increase construction labor in such quantities and crafts as will eliminate backlog of work.
   b) Increase number of working hours per shift, shifts per working day, working days per week, amount of construction equipment, or any combination of foregoing to eliminate backlog of work.
   c) Reschedule work (yet remain in conformance with Drawings and Specifications).
3. Prior to proceeding with any of above actions, Contractor shall notify Public Works Project Manager.

E. Maintain current Construction Schedule at all times. Revise Construction Schedule in same detail as original and accompany with explanation of reasons for revision. Schedule shall be subject to approval by Architect / Engineer and Public Works Project Manager.

25. PAYMENTS TO CONTRACTOR

A. Contractor shall provide:
1. Detailed estimate giving complete breakdown of contract price by Specification Division; and
2. Periodic itemized estimates of work done for purpose of making partial payments thereon.

B. Submit these estimates for approval first to Architect / Engineer, then to Public Works Project Manager. Costs employed in making up any of these schedules are for determining

basis of partial payments and not considered as fixing basis for additions to or deductions from Contract price.

C. County will make partial payments to Contractor for value, proportionate to amount of Contract, of all labor and material incorporated in the Work during preceding calendar month upon receipt of Application and Certificate for Payment form from Architect / Engineer and approval of Department.

D. Contractor shall submit for approval first to Architect / Engineer, and then to Public Works Project Manager all Application and Certificate for Payment forms. If requested, Application and Certificate for Payment shall be supported by such additional evidence as may be required, showing Contractor's right to payment claimed.

E. Application and Certificate for Payment for preparatory work and materials delivered and suitably stored at site to be incorporated into the Work at some future period, will be given due consideration. Requesting payment for materials stored off site, may be rejected, however, if deemed essential for reasons of job progress, protection, or other sufficient cause, requests will be considered, conditional upon submission by Contractor of bills of sale, photographs and such other procedures as will adequately protect County's interest such as storage in bonded warehouse with adequate coverage. If there is any error in payment, Contractor is obligated to notify Department immediately, but no longer than ten (10) business days from receipt of payment.

F. Payments by County will be due within forty-five (45) business days after receipt by Department of Application and Certificate for Payment.

G. County will retain five percent (5%) of each Application and Certificate for Payment until final completion and acceptance of all the Work covered by Contract. However, anytime after fifty percent (50%) of the Work has been furnished and installed at site, County will make remaining payments in full if Architect / Engineer and Public Works Project Manager find that progress of the Work corresponds with Construction Schedule. If Architect / Engineer and Public Works Project Manager find that progress of the Work does not correspond with Construction Schedule, County may retain up to ten percent (10%) of each Application and Certificate for Payment for the Work completed.

H. All material and work covered by partial payments made shall become sole property of County, but this provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made, or restoration of any damaged work, or as waiver of right of County to require fulfillment of all of terms of Contract.

I. County will make final payment within sixty (60) calendar days after final completion of the Work, and will constitute acceptance thereof.

J. County may make payment in full, including retained percentages and less authorized deductions, upon completion and acceptance of each Division where price is stated separately in Contract.

K. Every contractor engaged in performance of any contract for Department of Public Works, Highway & Transportation shall submit to this Department, as requested and with final application for payment for work under said contract, affidavit(s) as required to prove that all

debts and claims against this Work are paid in full or otherwise satisfied, and give final evidence of release of all liens against the Work and County.

26. WITHHOLDING OF PAYMENTS

A. County, after having served written notice on said Contractor, may either pay directly any unpaid bills of which Department has written notice, or withhold from Contractor's unpaid compensation sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged; whereupon, payment to Contractor shall be resumed in accordance with terms of this Contract, but in no event shall these provisions be construed to impose any obligations upon County to either Contractor or Contractor's Surety.

B. In paying any unpaid bills of Contractor, County shall be deemed agent of Contractor, and any payment so made by County, shall be considered as payment made under Contract by County to Contractor and County shall not be liable to Contractor for any such payment made in good faith.

C. Contractor shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives from all claims growing out of lawful demands of subcontractors, laborers, workers, mechanics, material men, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in performance of this Contract.

D. At Department's request, Contractor shall furnish satisfactory evidence that all obligations of nature designated above have been paid, discharged or waived.

27. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

A. Making of final payment shall constitute waiver of all claims by County except those arising from:
   1. Unsettled lien;
   2. Faulty or defective work appearing after substantial completion;
   3. Failure of the Work to comply with requirements of Construction Documents; or
   4. Terms of any special guarantees required by Construction Documents.

B. Acceptance of final payment shall constitute waiver of all claims by Contractor.

28. PAYMENTS BY CONTRACTOR

A. Contractor shall pay following not later than fifth (5^{th}) business day following each payment received from County:
   1. All transportation and utility services rendered;
   2. All materials, tools, and other expendable equipment that have been delivered at site of the Work to extent of ninety percent (90%) of cost thereof, and balance of cost thereof when said balance is paid to Contractor; and
   3. Each subcontractor, respective amount allowed Contractor because of work performed by subcontractor to extent of subcontractor's interest therein.

29. CONTRACT SECURITY

A. Contractor shall furnish Performance and Payment Bonds in amount at least equal to one hundred percent (100%) of Contract price as security for faithful performance of this Contract and payment of all persons performing labor on project under this Contract and furnishing materials in connection with this Contract.

B. Sample Performance and Payment Bonds that Contractor will be required to execute is bound into these Construction Documents. Before construction Contract is consummated, completed Performance and Payment Bonds must be approved by Department.

30. ASSIGNMENTS

A. Contractor shall not assign whole or any part of this Contract or any moneys due or to become due hereunder without written consent of Department. In case Contractor assigns all or any part of any moneys due or to become due under this Contract, instrument of assignment shall contain clause substantially to effect that it is agreed that right of assignee in and to any moneys due or to become due to Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for performance of the Work called for in this Contract.

31. MUTUAL RESPONSIBILITY OF CONTRACTORS

A. If, through acts of neglect on part of Contractor or any subcontractor shall suffer loss or damage on the Work, Contractor agrees to settle with such subcontractor by agreement or arbitration if such other subcontractor will so settle. If such subcontractor shall assert any claim against County on account of any damage alleged to have been sustained, Department shall notify Contractor, who shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives against any such claim.

32. SEPARATE CONTRACTS

A. Department may award other contracts for the Work and all Contractors shall fully cooperate with each other and carefully adjust their work to that provided under other contracts as may be directed by Department. No Contractor shall commit or permit any act that will interfere with performance of the Work by any other Contractor.

B. Contractor shall coordinate the Work with those of other Contractors. Cooperation will be required in arrangement for storage of materials and in detailed execution of the Work. Contractor, including subcontractors, shall keep informed of progress and detail work of others and shall notify Architect / Engineer or Department immediately of lack of progress or defective workmanship on part of others. Failure of Contractor to keep informed of the Work progressing on site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by Contractor of status of the Work as being satisfactory for proper coordination with Contractor's own work.

33. SUBCONTRACTS

A. Contractor may use services of specialty subcontractors on those parts of the Work that, under normal contracting practices, are performed by specialty subcontractors.

B. Contractor shall not award any work to any subcontractor without prior approval of Department. Qualifications of subcontractors shall be same as qualifications of Contractor. Request for subcontractor approval shall be submitted to Department fifteen (15) business days before start of subcontractor's work. If subcontractors are changed or added, Contractor shall notify Department in writing.

C. Contractor shall be as fully responsible to County for acts and omissions of subcontractors, and of persons either directly or indirectly employed by them, as Contractor is for acts and omissions of persons directly employed by Contractor.

D. Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to Contractor by terms of General Conditions of Contract and other Construction Documents insofar as applicable to work of subcontractors and to give Contractor same power as regards terminating any subcontract that Department may exercise over Contractor under any provision of Construction Documents.

E. Nothing contained in this Contract shall create any contractual relation between any subcontractor and County.

F. Contractor shall insert in all subcontracts, Articles 26, 33, 43 and 45, respectively entitled: "Withholding of Payments", "Subcontracts", "Affirmative Action Provision and Minority / Women / Disadvantaged Business Enterprises", and "Minimum Wages", and shall further require all subcontractors to incorporate physically these same Articles in all subcontracts.

34. PUBLIC WORKS PROJECT MANAGER'S AUTHORITY

A. Public Works Project Manager shall:
   1. Administer and ensure compliance with Construction Documents;
   2. Provide responsible on-site observations of construction and have authority to request work and to stop work whenever necessary to insure proper enforcement of Construction Documents;
   3. Convene and chair project meetings and foreman's coordination meetings when necessary to coordinate resolution of conflicts between Contractors, Architects, Engineers, Consultants, and Department; and
   4. Check and inspect material, equipment and installation procedures of all trades for proper workmanship and for compliance with Drawings, Specifications and Shop Drawings, permit no material on project site that is not satisfactory and reject work not in compliance with Construction Documents.

35. ARCHITECT / ENGINEER'S AUTHORITY

A. Architect / Engineer is retained by, and is responsible to Department acting for County.

B. Architect / Engineer shall determine amount, quality, acceptability, and fitness of several kinds of work and materials that are provided under this Contract and shall decide all questions that may arise in relation to said work and construction thereof.

C. Architect / Engineer shall decide meaning and intent of any portion of Specifications and of any Drawings where they may be found obscure or be in dispute.

D. Architect / Engineer shall provide responsible observation of construction. Architect / Engineer has authority to stop the Work whenever such stoppage may be necessary to insure proper execution of Construction Documents.

E. Architect / Engineer shall be interpreter of conditions of Construction Documents and judge of its performance.

F. Within reasonable time, Architect / Engineer shall make decisions on all matters relating to progress of the Work or interpretation of Construction Documents.

G. Architect / Engineer's decisions are subject to review by Public Works Project Manager.

36. STATED ALLOWANCES

A. Stated allowances enumerated in Instructions to Bidders shall cover net cost of materials or equipment, and all applicable taxes. Contractor's cost of delivery and unloading at site, handling costs on site, labor, installation costs, overhead, profit and any other incidental costs shall be included in Contractor's bid, but not as part of cash allowance.

B. Department will solicit at least two (2) bids on materials or equipment for which allowance is stated and select on basis of lowest qualified responsible bid. Contractor will then be instructed to purchase "Allowed Materials". If actual price for purchasing "Allowed Materials", including taxes, is more or less than "Cash Allowance", Contract price shall be adjusted accordingly. Adjustment in Contract price shall not contain any cost items excluded from cash allowance.

37. ESTIMATES OF QUANTITIES

A. Whenever estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of Construction Documents, they are given for use in comparing bids and right is especially reserved to increase or diminish them as they may be deemed reasonably necessary or desirable by Department to complete the Work included in this Contract, and cost for such increase or diminution shall be adjusted in manner provided for in General Conditions of Contract Article 18 entitled "Changes in the Work".

38. LANDS AND RIGHTS-OF-WAY

A. Prior to start of construction, County shall furnish all land and rights-of-way necessary for carrying out and completion of the Work to be performed under this Contract.

39. GENERAL GUARANTEE

A. Neither final certificate of payment nor any provision in Construction Documents nor partial or entire occupancy of premises by County shall constitute acceptance of work not done in accordance with Construction Documents or relieve Contractor of liability in respect to any expressed warranties or responsibility for faulty materials or workmanship.

1. In no event shall making of any payment required by Contract constitute or be construed as waiver by County of any breach of covenants of Contract or waiver of any default of Contractor and making of any such payment by County while any such default or breach shall exist shall in no way impair or prejudice right of County with respect to recovery of damages or other remedy as result of such breach or default.

B. Contractor shall remedy and make good all defective workmanship and materials and pay for any damage to other work resulting there from, which appear within period of one (1) year from date of substantial completion, providing such defects are not clearly due to abuse or misuse by County. Department will give notice of observed defects with reasonable promptness.

C. Guarantee on work executed after certified date of substantial completion will begin on date when such work is inspected and approved by Architect / Engineer and Public Works Project Manager.

D. Where guarantees or warrantees are required in sections of Specifications for periods in excess of one (1) year, such longer terms shall apply; however, Contractor's Performance and Payment Bonds shall not apply to any guarantee or warranty period in excess of one (1) year.

40. CONFLICTING CONDITIONS

A. Any provision in any of Construction Documents which may be in conflict or inconsistent with any Articles in these General Conditions of Contract or Supplementary Conditions shall be void to extent of such conflict or inconsistency.

B. In case of ambiguity or conflict between Drawings and Specifications, Specifications shall govern.

C. Printed dimensions shall be followed in preference to measurements by scale. Large-scale drawings take precedence over small-scale drawings. Dimensions on Drawings and details are subject to field measurements of adjacent work.

41. NOTICE AND SERVICE THEREOF

A. Any notice to Contractor from Department relative to any part of this Contract shall be in writing and considered delivered and service thereof completed, when said notice is posted, by certified or registered mail, to Contractor at Contractor's last given address, or delivered in person to said Contractor, or Contractor's authorized representative on the Work.

42. PROTECTION OF LIVES AND HEALTH

A. In order to protect lives and health of Contractor's employees under Contract, Contractor shall comply with all pertinent provisions of Wisconsin Administrative Code, Rules of Department of Commerce, relating to Safety and Health.

B. Contractor alone shall be responsible for safety, efficiency and adequacy of Contractor's tools, equipment and methods, and for any damage that may result from their failure or their improper construction, maintenance or operation.

43. AFFIRMATIVE ACTION PROVISION AND MINORITY / WOMEN / DISADVANTAGED BUSINESS ENTERPRISES

A. Affirmative Action Provisions.
   1. During term of their Contract, Contractor agrees not to discriminate on basis of race, religion, color, sex, handicap, age, sexual preference, marital status, physical appearance, or national origin against any person, whether recipient of services (actual or potential), employee, or applicant for employment. Such equal opportunity shall include but not be limited to following: employment, upgrading, demotion, transfer, recruitment, advertising, layoff, termination, training, rates of pay, and any other form of compensation or level of service(s). Contractor agrees to post in conspicuous places, these affirmative action standards so as to be visible to all employees, service recipients and applicants for this paragraph. Listing of prohibited bases for discrimination shall no be construed to amend in any fashion state or federal law setting forth additional bases and exceptions shall be permitted only to extent allowable in state or federal law.
   2. Contractor is subject to this Article only if Contractor has ten (10) or more employees and receives $10,000.00 or more in annual aggregate contracts with County. Contractor shall file and Affirmative Action Plan with Dane County Contract Compliance Officer in accord with Chapter 19 of Dane County Code of Ordinances. Such plan must be filed within fifteen (15) business days of effective date of this Contract and failure to do so by said date shall constitute ground for immediate termination of Contract by County. Contractor shall also, during term of this Contract, provide copies of all announcements of employment opportunities to County's Contract Compliance Office, and shall report annually number of persons, by race, sex and handicap status, who apply for employment, and, similarly classified, number hired and number rejected.
   3. Contact Dane County Contract Compliance Officer at Dane County Contract Compliance Office, 210 Martin Luther King, Jr. Blvd., Room 421, Madison, WI 53703, 608/266-4114.
   4. In all solicitations for employment placed on Contractor's behalf during term of this Contract, Contractor shall include statement to affect Contractor is "Equal Opportunity Employer". Contractor agrees to furnish all information and reports required by County's Contract Compliance Officer as same relate to affirmative action and nondiscrimination, which may include any books, records, or accounts deemed appropriate to determine compliance with Chapter 19, Dane County Code of Ordinances, and provision of this Contract.

B. Minority / Women / Disadvantaged / Emerging Small Business Enterprises.
   1. Chapter 19.508 of Dane County Code of Ordinances is official policy of Dane County regarding utilization of, to fullest extent of, Minority Business Enterprises (MBEs), Women Business Enterprises (WBEs) Disadvantage Business Enterprises (DBEs) and Emerging Small Business Enterprises (ESBEs).
   2. Contractor may utilize MBEs / WBEs / DBEs / ESBEs as subcontractors or suppliers. List of subcontractors will be required of low bidder as stated in this Contract. List shall indicate which are MBEs / WBEs / DBEs / ESBEs and percentage of subcontract awarded, shown as percentage of total dollar amount of bid.

44. COMPLIANCE WITH FAIR LABOR STANDARDS

A. During term of this Contract, Contractor shall report to County Contract Compliance Officer, within ten (10) business days, any allegations to, or findings by National Labor Relations Board (NLRB) or Wisconsin Employment Relations Commission (WERC) that Contractor has violated statute or regulation regarding labor standards or relations. If investigation by

Contract Compliance Officer results in final determination that matter adversely affects Contractor's responsibilities under this Contract, and which recommends termination, suspension or cancellation of this Contract, County may take such action.

B. Contractor may appeal any adverse finding by Contract Compliance Officer as set forth in Dane County Ordinance 25.015(11)(c) through (e).

C. Contractor shall post this statement in prominent place visible to employees: "As condition of receiving and maintaining contract with Dane County, this employer shall comply with federal, state and all other applicable laws prohibiting retaliation or union organizing."

45. DOMESTIC PARTNERSHIP BENEFITS

A. Not Used.

46. USE AND OCCUPANCY PRIOR TO ACCEPTANCE

A. Contractor agrees to use and occupancy of portion or unit of the Work before formal acceptance by Department, provided Department:
   1. Secures written consent of Contractor; except when in opinion of Public Works Project Manager, Contractor is chargeable with unwarranted delay in final cleanup of punch list items or other Contract requirements.
   2. Secures endorsement from insurance carrier and consent of Surety permitting occupancy of building or use of the Work during remaining period of construction, or, secures consent of Surety.
   3. Assumes all costs and maintenance of heat, electricity and water.
   4. Accepts all work completed within that portion or unit of the Work to be occupied, at time of occupancy.

47. MINIMUM WAGES

A. Contractor shall post, at appropriate conspicuous point on site of project, schedule showing all determined minimum wage rates for various classes of laborers and mechanics to be engaged in the Work under this Contract and all deductions, if any, required by law to be made from unpaid wages actually earned by laborers and mechanics so engaged.

B. Supplementary Conditions section in Construction Documents may list wage determinations required by State Law.

C. If, after award of Contract, it becomes necessary to employ any person in trade or occupation not classified in wage determinations, such person shall be paid at not less than such rate as shall be determined by Wisconsin Department of Workforce Development. Such approved minimum rate shall be retroactive to time of initial employment of such person in such trade or occupation. Contractor shall notify Department of Contractor's intention to employ persons in trades or occupations not so classified in sufficient time for Department to obtain approved rates for such trades or occupations.

D. Specified wage rates are minimum rates only, and Department will not consider any claims for additional compensation made by Contractor because of payment by Contractor of any wage rate in excess of applicable rate contained in this Contract. Contractor shall adjust any disputes in regard to payment of wages in excess of those specified in this Contract.

48. CLAIMS

A. No claim may be made until Department's Deputy Public Works Director has reviewed Architect / Engineer's decision as provided for in Article 35 of General Conditions of Contract. If any claim remains unresolved after such review by Department's Assistant Public Works Director the claim may be filed under Wisconsin Statute 893.80. Work shall progress during period of any dispute or claim. Unless specifically agreed between parties, venue will be in Dane County, Wisconsin.

49. ANTITRUST AGREEMENT

A. Contractor and County recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by County. Therefore, Contractor hereby assigns to County any and all claims for such overcharges as to goods and materials purchased in connection with this Contract, except as to overcharges which result from antitrust violations commencing after price is established under this Contract and any change order thereto.

50. INSURANCE

A. Contractor Carried Insurance:
   1. Contractor shall not commence work under this Contract until Contractor has obtained all insurance required under this Article and has provided evidence of such insurance to Risk Manager, 425 City-County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53703. Contractor shall not allow any subcontractor to commence work until insurance required of subcontractor has been so obtained and approved. Company providing insurance must be licensed to do business in Wisconsin.
   2. Worker's Compensation Insurance:
      a) Contractor shall procure and shall maintain during life of this Contract, Worker's Compensation Insurance as required by statute for all of Contractor's employees engaged in work at site of project under this Contract and, in case of any such work sublet, Contractor shall require subcontractor similarly to provide Worker's Compensation Insurance for all of latter's employees to be engaged in such work unless such employees are covered by protection afforded by Contractor's Worker's Compensation Insurance.
      b) If any claim of employees engaged in hazardous work on project under this Contract is not protected under Worker's Compensation Statute, Contractor shall provide and shall cause each subcontractor to provide adequate Employer's Liability Insurance for protection of such of Contractor's employees as are not otherwise protected.
   3. Contractor's Public Liability and Property Damage Insurance:
      a) Contractor shall procure and maintain during life of this Contract, Contractor's Public Liability Insurance and Contractor's Property Damage Insurance in amount not less than $1,000,000 bodily injury, including accidental death, to any one person, and subject to same limit for each person, in amount not less than $1,000,000 on account of one accident, and Contractor's Property Damage Insurance in amount not less then $1,000,000 or combined single limit of at least $1,000,000 with excess coverage over and above general liability in amount not less than $5,000,000. Contractor shall add "Dane County" as additional insured for each project.
      b) Contractor's Public Liability and Property Damage Insurance shall include Products, Completed Operation, and Contractual Liability under Insurance Contract.

"Contractor shall in all instances save, defend, indemnify and hold harmless County and Architect / Engineer against all claims, demands, liabilities, damages or any other costs which may accrue in prosecution of the Work and that Contractor will save, defend, indemnify and hold harmless County and Architect / Engineer from all damages caused by or as result of Contractor's operations" and each shall be listed as additional insured on Contractor's and sub-contractors' insurance policies.

c) Obligations of Contractor under Article 50.A.2.b) shall not extend to liability of Architect / Engineer, agents or employees thereof, arising out of:
   1) Preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications; or
   2) Giving of or failure to give directions or instructions by Architect / Engineer, agents or employees thereof provided such giving or failure to give is primary cause of injury or damage.

d) Contractor shall procure and shall maintain during life of this Contract, Comprehensive Automobile Liability Insurance covering owned, non-owned and hired automobiles for limits of not less than $1,000,000 each accident single limit, bodily injury and property damage combined with excess coverage over and above general liability in amount not less than $5,000,000.

e) Contractor shall either:
   1) Require each subcontractor to procure and to maintain during life of subcontract, subcontractor's Public Liability Property Damage Insurance, and Comprehensive Automobile Liability Insurance of type and in same amount specified in preceding paragraphs; or
   2) Insure activities of subcontractors in Contractor's own policy.

4. Scope of Insurance and Special Hazards: Insurance required under Article 50.A.2 & 50.A.3. hereof shall provide adequate protection for Contractor and subcontractors, respectively, against damage claims which may arise from operations under this Contract, whether such operation be by insured or by anyone directly or indirectly employed by insured and also against any of special hazards which may be encountered in performance of this Contract as enumerated in Supplementary Conditions.
5. Proof of Carriage of Insurance: Contractor shall furnish Risk Manager with certificates showing type, amount, class of operations covered, effective dates, dates of expiration of policies and "Dane County" listed as additional insured. Such certificates shall also contain (substantially) following statement: "Insurance covered by this certificate will not be canceled or materially altered, except after ten (10) business days written notice has been received by Risk Manager."

B. Builder's Risk:
   1. County shall provide Builder's Risk insurance coverage for its insurable interests in construction or renovation projects with completed value of $1,000,000 or less. Therefore, if project completed value is more than $1,000,000, Contractor shall obtain and maintain in force, at its own expense, Builder's Risk Insurance on all risks for amount equal to full completed value of covered structure or replacement value of alterations or additions. Any deductible shall not exceed $25,000 for each loss. Policy shall include occupancy clause and list Dane County as loss payee.

C. Indemnification / Hold Harmless:
   1. Contractor shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from performance of the Work, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of

tangible property (other than the Work itself) including loss of use resulting therefrom, and is caused in whole or in part by any act or omission of Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by part indemnified hereunder.

2. In any and all claims against Dane County, its boards, commissions, agencies, officers, employees and representatives or by any employee of Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, indemnification obligation under this Contract shall not be limited in any way by any limitation on amount or type of damages, compensation or benefits payable by or for Contractor or any subcontractor under worker's compensation acts, disability benefits or other employee benefit acts.
3. Obligations of Contractor under this Contract shall not extend to liability of Architect / Engineer, its agents or employees arising out of:
   a) Preparation or approval of maps, drawings, opinion, reports, surveys, change orders, designs or specifications; or
   b) Giving of or failure to give directions or instruction by Architect / Engineer, its agents or employees provided such giving or failure to give is primary cause of injury or damage.
4. Dane County shall not be liable to Contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by third parties.

51. WISCONSIN LAW CONTROLLING

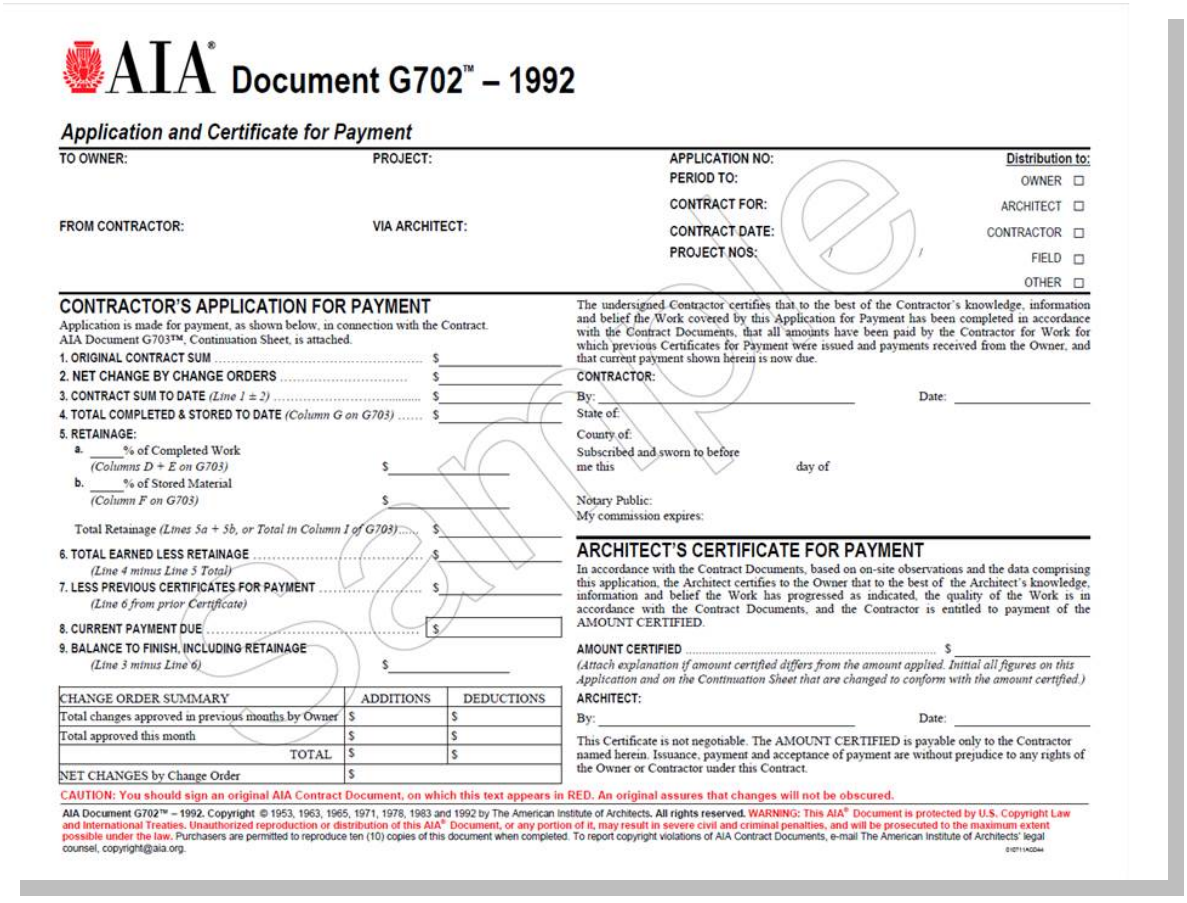
A. It is expressly understood and agreed to by parties hereto that in event of any disagreement or controversy between parties, Wisconsin law shall be controlling.

SECTION 00 73 00

SUPPLEMENTARY CONDITIONS

1. APPLICATION & CERTIFICATE FOR PAYMENT

A. Every contractor engaged in performance of any contract for Department of Public Works, Highway & Transportation shall submit partial and final Application & Certificate for Payment for work under said contract. Form shall provide similar information as shown on AIA G702™ and G703™ forms (samples shown below). Forms shall be submitted to project Architect / Engineer for approval.



AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER: PROJECT: APPLICATION NO: Distribution to:
PERIOD TO: OWNER ☐
CONTRACT FOR: ARCHITECT ☐
FROM CONTRACTOR: VIA ARCHITECT: CONTRACT DATE: CONTRACTOR ☐
PROJECT NOS: / / FIELD ☐
OTHER ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703™, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM ..... $
2. NET CHANGE BY CHANGE ORDERS ..... $
3. CONTRACT SUM TO DATE *(Line 1 ± 2)* ..... $
4. TOTAL COMPLETED & STORED TO DATE *(Column G on G703)* ..... $
5. RETAINAGE:
   a. ____% of Completed Work *(Columns D + E on G703)* $
   b. ____% of Stored Material *(Column F on G703)* $
   Total Retainage *(Lines 5a + 5b, or Total in Column I of G703)* ..... $
6. TOTAL EARNED LESS RETAINAGE ..... $ *(Line 4 minus Line 5 Total)*
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT ..... $ *(Line 6 from prior Certificate)*
8. CURRENT PAYMENT DUE ..... $
9. BALANCE TO FINISH, INCLUDING RETAINAGE *(Line 3 minus Line 6)* $

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this month	$	$
TOTAL	$	$
NET CHANGES by Change Order	$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:
By: Date:
State of:
County of:
Subscribed and sworn to before me this day of
Notary Public:
My commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)
ARCHITECT:
By: Date:

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA® Document G703™ – 1992

Continuation Sheet

AIA Document G702™–1992, Application and Certificate for Payment, or G732™–2009, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED: FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED: THIS PERIOD	MATERIALS PRESENTLY STORED (Not in D or E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C – G)	RETAINAGE (If variable rate)
	GRAND TOTAL								

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

END OF SECTION

Department of Public Works, Highway & Transportation
Public Works Engineering Division
608/266-4018

Gerald J. Mandli, P.E.
Commissioner / Director

Joseph T. Parisi
County Executive

Deputy Director
Todd Draper

1919 Alliant Energy Center Way
Madison, Wisconsin 53713
Fax: 608/267-1533
www.countyofdane.com/pwht/public_works.aspx

BEST VALUE CONTRACTING APPLICATION

CONTRACTORS / LICENSURE APPLICANTS

The Dane County Department of Public Works requires all contractors to be pre-qualified as a best value contractor with the County prior to being awarded a contract. In addition, the County pre-qualifies potential contractors and sub-contractors who wish to work on County contracts. Subcontractors must become pre-qualified ten (10) days prior to commencing work under any Dane County Public Works Contract. Potential subcontractors are urged to become pre-qualified as early as possible. This document shall be completed, properly executed, along with the necessary attachments and additional information that the County requires for the protection and welfare of the public in the performance of a County contract.

Contractors or subcontractors of any tier who attain pre-qualification status will retain that status for a period of two (2) years from the date of qualification. Contractors shall notify the Dane County Department of Public Works, Highway & Transportation within fifteen (15) days of any changes to its business or operations that are relevant to the pre-qualification application. Failure to do so could result in suspension, revocation of the contractor's pre-qualification, debarment from County contracts for up to three (3) years and / or other sanctions available under the law.

No contracts will be awarded for construction work performed on Dane County projects unless the contractor is currently approved as a Wisconsin Trade Trainer or has applied for approval as an Apprenticeship Trade Trainer to the Wisconsin Department of Workforce Development and agrees to an acceptable apprenticeship program. If you are not currently approved as a Wisconsin Trade Trainer, or have not applied for approval as an Apprenticeship Trade Trainer, please contact the Department of Workforce Development - Bureau of Apprenticeship Standards at 608/266-3133 or visit their web site at: dwd.wisconsin.gov/apprenticeship/.

EXEMPTIONS

- Contractors who employ less than five (5) apprenticeable trade workers are not required to pre-qualify.
- Contractors performing work that does not apply to an apprenticeable trade, as outlined in Appendix A.
- The contractor / subcontractor provides sufficient documentation to demonstrate one or more of the following:
  - apprentices are not available in a specific geographic area;
  - the applicable apprenticeship program is unsuitable or unavailable; or
  - there is a documented depression of the local construction market which prevents compliance.

SEC.	PROOF OF RESPONSIBILITY	CHECK IF APPLICABLE
1	Does your firm possesses all technical qualifications and resources, including equipment, personnel and financial resources, necessary to perform the work required for any project or obtain the same through the use of responsible, pre-qualified subcontractors?	Yes: ☐ No: ☐
2	Will your firm possess all valid, effective licenses, registrations or certificates required by federal, state, county, or local law, which are necessary for the type of work to be performed including, but not limited to, those for any type of trade work or specialty work?	Yes: ☐ No: ☐
3	Will your firm meet all bonding requirements as required by applicable law or contract specifications?	Yes: ☐ No: ☐
4	Will your firm meet all insurance requirements as required by applicable law or specifications, including general liability insurance, workers compensation insurance and unemployment insurance requirements?	Yes: ☐ No: ☐
5	Will your firm maintain a substance abuse policy for employees hired for public works contracts that comply with Wis. Stats. Sec. 103.503?	Yes: ☐ No: ☐
6	Does your firm acknowledge that it must pay all craft employees on public works projects the wage rates and benefits required under Section 66.0903 of the Wisconsin Statutes?	Yes: ☐ No: ☐
7	Will your firm fully abide by the equal opportunity and affirmative action requirements of all applicable laws, including County ordinances?	Yes: ☐ No: ☐
8	In the past three (3) years, has your firm had control or has another corporation, partnership or other business entity operating in the construction industry controlled it? If so, please attach a statement explaining the nature of the firm relationship?	Yes: ☐ No: ☐ If Yes, attach details.
9	In the past three (3) years, has your firm had any type of business, contracting or trade license, certification or registration revoked or suspended?	Yes: ☐ No: ☐ If Yes, attach details.
10	In the past three (3) years, has your firm been debarred by any federal, state or local government agency?	Yes: ☐ No: ☐ If Yes, attach details.
11	In the past three (3) years, has your firm defaulted or failed to complete any contract?	Yes: ☐ No: ☐ If Yes, attach details.
12	In the past three (3) years, has your firm committed a willful violation of federal, state or local government safety laws as determined by a final decision of a court or government agency authority.	Yes: ☐ No: ☐ If Yes, attach details.
13	In the past three (3) years, has your firm been in violation of any law relating to your contracting business where the penalty for such violation resulted in the imposition of a penalty greater than $10,000?	Yes: ☐ No: ☐ If Yes, attach details.
14	Is your firm Executive Order 108 pre-certified with the State of Wisconsin?	Yes: ☐ No: ☐
15	Is your firm an active Wisconsin Trade Trainer as determined by the Wisconsin Bureau of Apprenticeship Standards?	Yes: ☐ No: ☐
16	Is your firm exempt from being pre-qualified with Dane County?	Yes: ☐ No: ☐ If Yes, attach reason for exemption.
17	Does your firm acknowledge that in doing work under any County Public Works Contract, it will be required to use as subcontractors only those contractors that are also pre-qualified with the County or become so ten days prior to commencing work?	Yes: ☐ No: ☐
18	Contractor has been in business less than one year?	Yes: ☐ No: ☐
19	Is your firm a first time Contractor requesting a one time exemption, but, intend to comply on all future contracts and are taking steps typical of a “good faith” effort?	Yes: ☐ No: ☐
20	Not applicable. My firm does not intend to work on Best Value Contracts. Note: Best Value Contracting is required to bid on most Public Works Contracts (if unclear, please call Todd Draper 608-267-0119).	Yes: ☐ No: ☐

SIGNATURE SECTION

Your firm's Officer, or the individual who would sign a bid and / or contract documents must sign this document.

I do hereby certify that all statements herein contained are true and correct to the best of my knowledge:

Signature: _____

(Application is invalid without signature)

Print Name: _____ Date: _____

Title: _____

NAME AND ADDRESS OF CONTRACTOR	
Name of Firm:	
Address:	
City, State, Zip:	
Phone Number:	
Fax Number:	
E-mail Address:	

REMEMBER!

RETURN ALL TO FORMS AND ATTACHMENTS, OR QUESTIONS TO:

TODD DRAPER
EMAIL: DRAPER@COUNTYOFDANE.COM
OFFICE: (608) 267-0119, FAX: (608) 267-1533

DANE COUNTY DEPARTMENT OF PUBLIC WORKS, HGHWAY & TRANSPORTATION
1919 ALLIANT ENERGY CENTER WAY
MADISON, WI 53713

APPENDIX A

APPRENTICEABLE TRADES:

- Bricklayer
- Carpenter
- Cement Mason (Concrete Finisher)
- Cement Mason (Heavy Highway)
- Construction Craft Laborer
- Data Communications Installer
- Electrician
- Elevator Mechanic / Technician
- Environmental Systems Technician / HVAC Service Technician / HVAC Install & Service
- Glazier
- Heavy Equipment Operator / Operating Engineer
- Insulation Worker (Heat & Frost)
- Iron Worker (Assembler, Metal Buildings)
- Painter / Decorator
- Plasterer
- Plumber
- Roofer / Waterproofer
- Sheet Metal Worker
- Sprinkler Fitter
- Steamfitter (Service & Refrigeration)
- Taper & Finisher
- Telecommunications (Voice, Data & Video) Installer / Technician
- Tile Setter

END OF SECTION

SECTION 00 73 11

FAIR LABOR PRACTICES CERTIFICATION

The undersigned, for and on behalf of the BIDDER, APPLICANT or PROPOSER named herein, certifies as follows:

A. That he or she is an officer or duly authorized agent of the above-referenced BIDDER, APPLICANT or PROPOSER, which has a submitted a bid, application or proposal for a contract or agreement with the county of Dane.

B. That BIDDER, APPLICANT or PROPOSER has (check one):

_____ not been found by the National Labor Relations Board ("NLRB") or the Wisconsin Employment Relations Commission ("WERC") to have violated any statute or regulation regarding labor standards or relations in the seven years prior to the signature date of this Certification.

_____ been found by the National Labor Relations Board ("NLRB") or the Wisconsin Employment Relations Commission ("WERC") to have violated any statute or regulation regarding labor standards or relations in the seven years prior to the signature date of this Certification.

_____ _____

Officer or Authorized Agent Signature Date

_____

Printed or Typed Name and Title

_____

Printed or Typed Business Name

NOTE: You can find information regarding the violations described above at: www.nlrb.gov and werc.wi.gov.

For reference, Dane County Ordinance 25.09 is as follows:

(1) BIDDER RESPONSIBILITY. (a) Any bid, application or proposal for any contract with the county, including public works contracts regulated under chapter 40, shall include a certification indicating whether the bidder has been found by the National Labor Relations Board (NLRB) or the Wisconsin Employment Relations Committee (WERC) to have violated any statute or regulation regarding labor standards or relations within the last seven years. The Controller shall investigate any such finding and make a recommendation to the committee, which shall determine whether the conduct resulting in the finding affects the bidder's responsibility to perform the contract.

If you indicated that the NLRB or WERC have found you to have such a violation, you must include copies of any relevant information regarding such violation with your proposal, bid or application.

Include this completed Certification with your bid, application or proposal.

END OF SECTION

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SECTION 01 00 00

GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Summary
2. Summary of the Work
3. Contractor Use of Premises
4. Applications for Payment
5. Change Procedures
6. Alternates
7. Coordination
8. Cutting and Patching
9. Conferences
10. Progress Meetings
11. Job Site Administration
12. Submittal Procedures
13. Proposed Products List
14. Shop Drawings
15. Product Data
16. Samples
17. Manufacturers' Instructions
18. Manufacturers' Certificates
19. Quality Assurance / Quality Control of Installation
20. References
21. Interior Enclosures
22. Protection of Installed Work
23. Parking
24. Staging Areas
25. Occupancy During Construction and Conduct of Work
26. Protection
27. Progress Cleaning
28. Products
29. Transportation, Handling, Storage and Protection
30. Product Options
31. Substitutions
32. Starting Systems
33. Demonstration and Instructions
34. Contract Closeout Procedures
35. Final Cleaning
36. Adjusting
37. Operation and Maintenance Data
38. Spare Parts and Maintenance Materials
39. As-Built and Record Drawings and Specifications

1.2 SUMMARY OF THE WORK

A. Project Description: Perform the Work as specified and detailed in Construction Documents package. Contractor to provide construction services for the remodeling of several office spaces.

B. Work by Owner:
   1. Move out & move in staff in construction areas.
   2. Furnish & install switches in Contractor provided racks in Room 418B.
   3. Test & removal of any asbestos containing materials.

C. Permits: Prior to commencement of the Work, Contractor to secure any and all necessary permits for completion of the Work and facility occupancy.

1.3 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow work by Contractors or Subcontractors and access by Owner.

B. Coordinate utility outages and shutdowns with Owner.

1.4 APPLICATIONS FOR PAYMENT

A. Submit one (1) original copies with “wet” signatures of each application on AIA G702™ and G703™ forms or approved contractors invoice form.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Monthly.

D. Submit Applications for Payment to Architect / Engineer for initial approval. Architect / Engineer will forward approved copies to Owner who will also approve & process for payment.

1.5 CHANGE PROCEDURES

A. Contractor's costs for Products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from contingency allowance.

1.6 ALTERNATES

A. Alternates quoted on Bid Form shall be reviewed and accepted or rejected at Owner's option.

B. Coordinate related work and modify surrounding work as required.

C. Schedule of Alternates: there are no alternates proposed for this project.

1.7 COORDINATION

A. Coordinate scheduling, submittals, and work of various sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

C. Coordinate space requirements and installation of mechanical and electrical work that are indicated diagrammatically on Drawings.

D. Refer to Drawings for recommended work sequence and duration.

E. Contractor shall provide Public Works Project Manager with work plan that ensures the Work will be completed within required time of completion.

F. Construct work in stages to accommodate Fourth Floor Staff's operations. All activities shall be coordinated one (1) week (minimum) in advance with Public Works Project Manager unless noted otherwise in these specifications.

G. Public Works Project Manager may choose to photograph or videotape site or workers as the Work progresses.

1.8 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching new work; restore work with new Products.

B. Submit written request in advance of cutting or altering structural or building enclosure elements.

C. Fit work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

D. Refinish surfaces to match adjacent finishes.

1.9 CONFERENCES

A. Project shall have pre-bid conference; see Instructions to Bidders.

B. Owner will schedule preconstruction conference after Award of Contract for all affected parties.

C. Contractor shall submit Construction Schedule at pre-construction meeting.

D. When required in individual Specification section, convene pre-installation conference at project site prior to commencing work of Section.

1.10 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at one (1) per week, at time & day to be determined with Public Works Project Manager.

B. Preside at meetings, record minutes, and distribute copies within two (2) business days to those affected by decisions made.

C. Attendance at progress meetings by General Contractor, subcontractors, or their authorized representative, is mandatory.

D. Contractors shall give verbal reports of progress on the Work, discuss schedule for upcoming period and present all conflicts, discrepancies or other difficulties for resolution.

E. Day & time of progress meetings to be determined at pre-construction meeting.

1.11 JOB SITE ADMINISTRATION

A. Contractor shall have project superintendent on site minimum of four (4) hours per week during progress of the Work.

B. Architect / Engineer shall have representative on site regularly during progress of the Work.

1.12 SUBMITTAL PROCEDURES

A. Submittal form to identify Project, Contractor, Subcontractor or supplier; and pertinent Construction Documents references.

B. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with requirements of the Work and Construction Documents.

C. Identify variations from Construction Documents and Product or system limitations that may be detrimental to successful performance of completing the Work.

D. Revise and resubmit submittals as required; identify all changes made since previous submittal.

1.13 PROPOSED PRODUCTS LIST

A. Within fifteen (15) business days after date of Award of Contract, submit complete list of major Products proposed for use, with name of manufacturer, trade name, and model number of each Product.

1.14 SHOP DRAWINGS

A. Submit number of copies that Contractor requires, plus one (1) copy that shall be retained by Architect / Engineer, and one (1) copy that shall be retained by Public Works Project Manager.

1.15 PRODUCT DATA

A. Submit number of copies that Contractor requires, plus one (1) copy that shall be retained by Public Works Project Manager.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.

1.16 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of Product.

B. Submit samples of finishes from full range of manufacturers' standard colors, textures, and patterns for Public Works Project Manager's selection.

1.17 MANUFACTURERS' INSTRUCTIONS

A. When specified in individual Specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

1.18 MANUFACTURERS' CERTIFICATES

A. When specified in individual Specification sections, submit manufacturers' certificate to Public Works Project Manager for review, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.19 QUALITY ASSURANCE / QUALITY CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply fully with manufacturers' instructions.

C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.20 REFERENCES

A. Conform to reference standard by date of issue current as of date for receiving bids.

B. Should specified reference standard conflict with Construction Documents, request clarification from Public Works Project Manager before proceeding.

1.21 INTERIOR ENCLOSURES

A. Provide temporary partitions as required to separate work areas from Owner occupied areas, to prevent distribution of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

1.22 PROTECTION OF INSTALLED WORK

A. Protect installed work and provide special protection where specified in individual Specification sections.

1.23 PARKING

A. Arrange for temporary parking areas to accommodate construction personnel. One & only one parking stall for General Contractor shall be available at the Work site.

B. All contractors and their employees shall cooperate with General Contractor and others in parking of vehicles to avoid interference with normal operations and construction activities.

C. Do not obstruct existing service drives and parking lots with equipment, materials and / or vehicles. Keep accessible for Owner's use at all times.

1.24 STAGING AREAS

A. Coordinate staging areas with Public Works Project Manager prior to starting the Work.

B. On-site space for use as staging areas and storage of materials is limited and will be apportioned among various Contractors as their needs dictate with due regard for storage requirements of each Contractor. Each Contractor shall be responsible for safety of equipment and materials that are stored on site.

1.25 OCCUPANCY DURING CONSTRUCTION AND CONDUCT OF WORK

A. All construction material and salvage material shall be removed from facility or secured at day's end.

B. Smoking is prohibited on Dane County property.

C. Owner reserves right at any time to dismiss from premises any Contractor or construction personnel that do not uphold requirements of this Section.

D. Owner shall not be held liable for any lost time, wages, or impacts to construction schedule by any Contractor or construction personnel dismissed for failure to uphold requirements of this Section.

E. Areas of existing facility will be occupied during period when the Work is in progress. Work may be done during normal business hours (8:00 am to 4:30 pm), but confer with Owner, schedule work and store materials so as to interfere as little as possible with normal use of premises. Work performed on Saturday shall be by permission of Owner. Notify Owner when coring or similar noise making work is to be done and obtain Owner's written approval of schedule. If schedule is not convenient for Owner, reschedule and resubmit new times for Owner approval. Coring of floor along with other noisy work may have to be done on second and third shifts.

F. Work shall be done and temporary facilities furnished so as not to interfere with access to any occupied area and so as to cause least possible interference with normal operation of facility or any essential service thereof.

G. Contractor shall, at all times, provide approved, safe walkways and facility entrances for use by Owner, employees and public.

H. Contractor shall provide adequate protection for all parts of facility, its contents and occupants wherever the Work under this Contract is to be performed.

I. Each Contractor shall arrange with Owner to make necessary alterations, do new work, make connections to all utilities, etc., at such times as will not cause interruption of utility services to facility. Contractor doing this work shall protect, cap, cut off and / or replace and relocate existing pipes, electrical work and other active utilities encountered which may interfere with new construction work.

J. New work in extension of existing work shall correspond in all respects with that to which it connects or similar existing work unless otherwise indicated or specified.
   1. Existing work shall be cut, altered, removed or replaced as necessary for performance of Contract obligations.
   2. Work remaining in place, damaged or defaced by reason of work done under this Contract shall be restored equal to its condition at time of Award of Contract.
   3. If removal of work exposes discolored or unfinished surfaces or work out of alignment, such surfaces shall be refinished or materials replaced as necessary to make continuous work uniform and harmonious.

K. Contractor is not responsible for providing & maintaining temporary toilet facilities.

1.26 PROTECTION

A. Contractor shall protect from damage / injury all trees, shrubs, hedges, plantings, grass, mechanical, electrical & plumbing equipment, walks and driveways and pay for any damage to same resulting from insufficient or improper protection.

B. Contractor shall provide and maintain barricades & signage to prohibit public access to construction site.

C. Contractor shall provide and maintain guard lights at all barricades, railings, obstructions in streets, roads or sidewalks and at all trenches adjacent to public walks or roads.

1.27 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

1.28 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by Construction Documents.

1.29 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

A. Transport, handle, store and protect Products in accordance with manufacturer's instructions.

1.30 PRODUCT OPTIONS

A. Where definite material is specified, it is not intentional to discriminate against "equal" product made by another manufacturer. Intention is to set definite standard of material quality. Should bidder choose to bid materials other than those specified, bidder shall submit said materials specifications to Public Works Project Manager for approval at least seven (7) business days prior to Bid Due Date.

B. Products and materials that are not specified, but have been approved for use by Public Works Project Manager shall be identified in addenda to all bidding contractors.

C. Requests for material or product substitutions submitted after Bid Due Date shall not be considered. Owner reserves right to approve or reject substitutions based on Specification requirements and intended use.

1.31 SUBSTITUTIONS

A. Public Works Project Manager shall consider requests for Substitutions only up to seven (7) business days prior to date of Bid Due Date.

B. Document each request with complete data substantiating compliance of proposed Substitution with Construction Documents.

C. Submit one (1) electronic copy of requests for Substitution for consideration. Limit each request to one (1) proposed Substitution.

D. Substitutions shall not change contract price established at Bid Due Date.

1.32 STARTING SYSTEMS

A. Provide written notification prior to start-up of each equipment item or system.

B. Ensure that each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturers' instructions.

D. Submit written report that equipment or system has been properly installed and is functioning correctly.

1.33 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel prior to date of final inspection.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

C. Owner may choose to photograph or videotape demonstration session; demonstration and demonstrator shall be to level of satisfaction of Owner.

1.34 CONTRACT CLOSEOUT PROCEDURES

A. Submit written certification that Construction Documents have been reviewed, the Work has been inspected, and the Work is complete in accordance with Construction Documents and ready for Public Works Project Manager's inspection.

B. Submit final Application for Payment identifying total adjusted Contract Sum / Price, previous payments, and amount remaining due.

1.35 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior surfaces exposed to view.

C. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.36 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.37 OPERATION AND MAINTENANCE MANUAL

A. Provide two (2) bound, hard-copy operation and maintenance manuals that include all systems, materials, products, equipment, mechanical and electrical equipment and systems supplied and installed in the Work. Provide electronic version of operation and maintenance manual also.

1.38 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide Products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections.

B. Deliver to the Work site and place in location as directed.

1.39 AS-BUILT AND RECORD DRAWINGS AND SPECIFICATIONS

A. Contractor-produced Drawings and Specifications shall remain property of Contractor whether Project for which they are made is executed or not. Contractor shall furnish Architect / Engineer with original marked up redlines of Construction Documents' drawings and specifications that shall include all Addendums, Change Orders, Construction Bulletins, on-site changes, field corrections, etc. These are project As-Built Drawings & Specifications.

B. Architect / Engineer shall update original Construction Documents to include all Addendums & any other changes including those provided by Contractor in As-Built Drawings & Specifications. These updates are project Record Drawings & Specifications.

C. Architect / Engineer shall furnish Public Works Project Manager with Record Drawings as detailed in Professional Services Agreement.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT, DISPOSAL & RECYCLING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Summary
2. Waste Management Goals
3. Construction and / or Demolition Waste Management
4. Waste Management Plan
5. Reuse
6. Recycling
7. Materials Sorting and Storage On Site
8. Lists of Recycling Facilities Processors and Haulers
9. Waste Management Plan Form

B. Related Sections:
1. Section 01 00 00 - General Requirements

1.2 WASTE MANAGEMENT GOALS

A. Dane County requires that as many waste materials as possible produced as result of this project be salvaged, reused or recycled in order to minimize impact of construction waste on landfills and to minimize expenditure of energy and cost in fabricating new materials. Additional information may be found in Dane County Green Building Policy, Resolution 299, 1999-2000.

1.3 CONSTRUCTION AND / OR DEMOLITION WASTE MANAGEMENT

A. All construction and demolition waste suitable for recycling must go to Dane County Construction & Demolition Recycling Facility located at 7102 US Hwy 12, Madison, located across from Yahara Hills Golf Course. This facility can receive mixed loads of construction and demolition waste. For complete list of acceptable materials see www.countyofdane.com/pwht/recycle/CD_Recycle.aspx.

B. Dane County Landfill, also at 7102 US Hwy 12, Madison, must receive all other waste from this project. www.countyofdane.com/pwht/recycle/landfill.aspx.

1.4 WASTE MANAGEMENT PLAN

A. Contractor shall develop Waste Management Plan (WMP) for this project. Dane County's Special Projects & Materials Manager may be contacted with questions. Outlined in RECYCLING section of this specification are examples of materials that can be recycled or reused as well as recommendations for waste sorting methods.

B. Contractor shall complete WMP and include cost of recycling / reuse in Bid. WMP will be submitted to Public Works Project Manager within fifteen (15)

business days of Bid Due date. Copy of blank WMP form is in this Section. Submittal shall include cover letter and WMP form with:

1. Information on:
    a. Types of waste materials produced as result of work performed on site;
    b. Estimated quantities of waste produced;
    c. Identification of materials with potential to be recycled or reused;
    d. How materials will be recycled or reused;
    e. On-site storage and separation requirements (on site containers);
    f. Transportation methods; and
    g. Destinations.

1.5 REUSE

A. Contractors and subcontractors are encouraged to reuse as many waste materials as possible. Salvage should be investigated for materials not reusable on site.

1.6 RECYCLING

A. These materials must be recycled at Dane County Construction & Demolition Recycling Facility:
    1. Wood.
    2. Wood Pallets.
    3. PVC Plastic (pipe, siding, etc.).
    4. Asphalt & Concrete.
    5. Bricks & Masonry.
    6. Vinyl Siding.
    7. Cardboard.
    8. Metal.
    9. Unpainted Gypsum Drywall.
    10. Shingles.

B. These materials can be recycled elsewhere in Dane County area:
    1. Fluorescent Lamps.
    2. Foam Insulation & Packaging (extruded and expanded).
    3. Carpet Padding.
    4. Barrels & Drums.

C. All materials must be recycled at WDNR permitted waste processing facilities that adhere to all State Statutes.

1.7 MATERIALS SORTING AND STORAGE ON SITE

A. Contractor shall provide separate containers for recyclable materials. Number of containers will be dependent upon project and site conditions.

B. Contractor shall provide on-site locations for subcontractors supplied recycling containers to help facilitate recycling.

C. Mixed loads of recycled materials are allowed only per instructions at www.countyofdane.com/pwht/recycle/CD_Recycle.aspx.

1.8 LISTS OF RECYCLING FACILITIES PROCESSORS AND HAULERS

A. Refer to www.countyofdane.com/pwht/recycle/CD_Recycle.aspx for information on Dane County Construction & Demolition Recycling Facility.

B. Web site www.countyofdane.com/pwht/recycle/categories.aspx lists current information for Dane County Recycling Markets. Contractors can also contact Allison Rathsack at 608/266-4990, or local city, village, town recycling staff listed at site www.countyofdane.com/pwht/recycle/contacts.aspx. Statewide listings of recycling / reuse markets are available from UW Extension at https://www.uwgb.edu/shwec/.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

WASTE MANAGEMENT PLAN FORM

Contractor Name: _____

Address: _____

_____

Phone No.: _____ Recycling Coordinator: _____

MATERIAL	ESTIMATED QUANTITY	DISPOSAL METHOD (CHECK ONE)	RECYCLING / REUSE COMPANY OR DISPOSAL SITE
Salvaged & reused building materials	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Wood	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Wood Pallets	_____ units	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
PVC Plastic	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Asphalt & Concrete	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Bricks & Masonry	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Cardboard	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Metals	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Unpainted Gypsum / Drywall	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Fluorescent Lamps	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Foam Insulation	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Carpet Padding	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Barrels & Drums	_____ units	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Glass	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____

WASTE MANAGEMENT PLAN FORM

Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of building or structure.
   2. Salvage of existing items to be reused or recycled.

B. See Section 01 74 19 – Recycling regarding construction waste management.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed.

1.3 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.

B. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Predemolition Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner. Owner will remove hazardous materials under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, preconstruction videotapes and templates.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

G. Openings in floors must be patched. Surface anchors that constitute tripping hazards must be removed or ground smooth even to the floor level.

H. Any gaps found around ducts, pipes, conduits, etc. in fire-rated walls, smoke partitions, or any other partitions, must be patched and/or fire caulked.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 PREPARATION

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

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

D. Protect all surfaces including, but not limited to, windows, countertops, flooring, etc. during demotion and construction.

3.4 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before

starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Salvaged Carpet:
1. Score corner joints, cutting the adhesive tactile.
2. Stack removed carpet in manner where remainder of the tactile does not stick to the face of the carpet.
3. Store items in a secure area until delivery to Owner.
4. Transport salvaged carpet to Owner’s storage area designated by Owner.
5. Completely remove remaining carpet from floors.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 06 40 23

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood trim.

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

A. Samples:

1. Wood trim with shop-applied finish.

1.3 QUALITY ASSURANCE

A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."

1. Custom grade, unless indicated otherwise.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed.

1.5 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide wood materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: Match existing.

C. Wood Products to Comply with the Following:

1. Hardboard: AHA A135.4.
2. Softwood Plywood: DOC PS 1, Medium Density Overlay.

D. Standing and Running Trim.

1. For transparent-finished items wider than available lumber, use veneered construction. Do not glue for width.
2. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
3. Assemble casing in plant except where limitations of access to place of installation require field assembly.

2.2 ACCESSORIES

A. Wood Filler: Oil base, tinted to match surface color.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

C. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Contact Adhesive: 250 g/L.

D. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.4 FABRICATION

A. Interior Standing and Running Trim:

1. For transparent-finished trim items wider than available lumber, use veneered construction. Do not glue for width.

2. Back out or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
3. Assemble casings in plant except where limitations of access to place of installation require field assembly.
4. Trim: Match existing; paint/stain to match new Timely Frames on interior flush wood doors.
    a. Casing: Match existing with paint/stain to match new Timely Frames on interior flush wood doors.

2.5 SHOP FINISHING

A. Finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Back-priming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork.

C. Transparent Finish:
1. Grade: Premium.
2. AWI Finish System: Acrylic lacquer.
3. WI Finish System: Two (2), water-reducible acrylic lacquer.
4. Wash Coat for Stained Finish: Apply a wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
5. Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

3.2 PREPARATION

A. Provide anchoring devices for installation and embedding.

B. Provide templates and rough-in measurements.

3.3 INSTALLATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.

B. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

C. All finishes must be smooth, uniform in color and match approved samples.

D. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

E. Prior to final inspection, examine installation of the Work of this Section. Repair or replace all defects found. Leave installation clean, undamaged, and ready for use.

3.4 REPAIRING, ADJUSTING, AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

C. Leave surfaces clean and without defects.

END OF SECTION

SECTION 06 42 16

WOOD CLADDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood cladding (engineered wood wall surfacing).
2. Wood furring, blocking, shims, and hanging strips for installing flush wood cladding unless concealed within other construction before cladding installation.
3. Shop finishing of wood cladding.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show location of cladding, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.

C. Samples: For each wood cladding product specified.

1.3 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications**:** Certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Licensee of WI's Certified Compliance Program and acceptable to wood cladding manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver in manufacturer’s unopened containers, accurately labeled.

B. Store wood products flat and protected from impacts, falls, and spillage, and with special attention paid to the protection of the edges and corners.

C. Store in dry state, protected from weather. Products must be stored flat in a sealed, waterproof envelope on a smooth level surface, clear of the ground and away from exposure to water, moisture, temperature extremes, etc.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cladding until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 CLADDING, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of wood cladding (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.

2.2 WOOD CLADDING (ENGINEERED WOOD WALL SURFACING)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
   1. Stacked Wood.
   2. Windfall Lumber.
   3. Approved Equal.

B. Basis-of-Design Product: See Finish List.

C. Assemble cladding according to manufacturer’s written instructions.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.

2.4 FABRICATION

A. Complete fabrication, including assembly and finishing, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.5 SHOP FINISHING

A. General: Finish cladding at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing cladding, as applicable to each unit of work.

C. Finish: Water Based Clear/Top Coat VOC: 23 g/L.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cladding to average prevailing humidity conditions in installation areas.

B. Wood products for interior use must be acclimated for a minimum of seven (7) days in the environment in which they are to be installed. Proper acclimation requires an enclosed installation area where the wet-work has been completed and the HVAC system is operating and maintaining temperatures between 60 and 90 degrees F and relative humidity between 18 and 55 percent. The wood products must be “stacked and Stickered” format for proper air circulation. (Refer to manufacturer’s written and illustrated instructions.) Pay special attention to maintaining the flatness of the material while it is being stored and acclimated.

3.2 INSTALLATION

A. Follow manufacturer’s written instructions.

B. Install cladding level, plumb, true, and straight with no distortions. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

C. Anchor paneling to support substrate with concealed panel-hanger clips or blind nailing. Do not use face fastening unless covered by trim.

D. Touch up of the clear coat on end to end joints and butting or mitered corner joints as required.

E. Protect installed product from damage during remainder of construction period.

F. Replace or repair any damaged portions of work before Substantial Completion.

END OF SECTION

SECTION 07 05 33

FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior identification markings for fire and smoke assemblies per IBC 703.6.

1.2 REFERENCE STANDARDS

A. Wisconsin Commercial Building (2009 IBC).

1.3 SUBMITTALS

A. Section 01 3300 – Submittal Procedures.

B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of IBC.

B. IBC 703.6 Marking and Identification. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located in accessible concealed floor, floor-ceiling or attic spaces;
2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition.
3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording.
    a. Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify all substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Locate markings as required by IBC.

B. Install neatly, with horizontal edges level.

C. Protect from damage until Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, penetrations in smoke barriers, and penetrations in horizontal assemblies, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

    a. Penetrations located outside wall cavities.
    b. Penetrations located outside fire-resistance-rated shaft enclosures.
    c. Penetrations located in construction containing fire-protection-rated openings.
    d. Penetrating items larger than 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings indicated at both ambient temperatures and 400 deg F.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems that do not require removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Qualification Data: For Installer.

D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its “Qualified Firestop Contractor Program Requirements.”

B. Installation Responsibility: Assign installation of penetration firestopping and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

D. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Penetration firestopping tests shall be performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems bearing classification marking of qualified testing and inspecting agency.

E. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

G. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels, identifying product and manufacturer; date of manufacture; lot number; shelf lite, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of opening and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers**:**
   1. Grace, W. R. & Co.
   2. Johns Manville.
   3. 3M; Fire Protection Products Division.
   4. Tremco; Sealant/Weatherproofing Division.
   5. USG Corporation.
   6. Approved Equal.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items, if any.

B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of construction penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with rating determined by UL 1479.

   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated

2.3 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items, foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would

otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOPPING SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with through-penetration firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Identification: Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so that labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently gonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning – Penetration Firestoppping – Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage an independent inspecting agency to inspect penetration through-firestop systems and to prepare test reports. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with, or deviate from, requirements.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and installations comply with requirements.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
2. Interior joints in horizontal traffic surfaces.
3. Acoustical joint sealants.
4. Refer to Drawings and Joint Sealant Schedule at the end of this Section for specific joint locations and sealant types.

B. Related Sections include the following:

1. Division 07 Section “Penetration Firestopping.”

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for initial selection: For each type of sealant provide samples of full range of manufacturers available colors.

C. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

E. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

F. Warranties: Special warranties listed in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in original, unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation or joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4. deg C).
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance or other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint sealer manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance or other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.3 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids: Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provides products that comply with 21 CFR 177.2600.

F. Color of Exposed Joint Sealants: Sealant, generally, shall be the color of the adjacent material which lies in the same plane as the sealant. Verify all colors with Architect prior to installation.

2.4 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food; provide products that comply with 21 CFR 177.2600.

E. One part polyurethane, two parts polymer, or one part low-modulus silicone sealants at all interior joints, except horizontal surfaces, in which case acceptable products are as follows:

1. Products:
   a. Sika “Sikaflex-1a”.
   b. Sonneborn “Sololastic NP I or NP II”.
   c. Tremco Manufacturing Company “Dymeric” or “Dymonic”.
   d. Pecora “Dynatrol II”.
   e. G.E. “Silpruf”.
   f. Dow Corning “790”.

2.5 SILICONE JOINT SEALANTS

A. Mildew-Resistant Silicone Joint Sealant: ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. BASF Building Systems.
   b. Dow Corning Corporation.
   c. GE Advanced Materials - Silicones.
   d. May National Associates, Inc.
   e. Pecora Corporation.
   f. Polymeric Systems, Inc.
   g. Schnee-Morehead, Inc.
   h. Sika Corporation; Construction Products Division.
   i. Tremco Incorporated.

2. Type: Single component.
3. Grade: Nonsag.
4. Class: 100/50.

2.6 URETHANE JOINT SEALANTS

A. Urethane Joint Sealant: ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Building Systems.
    b. Bostik, Inc.
    c. Lymtal, International, Inc.
    d. May National Associates, Inc.
    e. Pacific Polymers International, Inc.
    f. Pecora Corporation.
    g. Polymeric Systems, Inc.
    h. Schnee-Morehead, Inc.
    i. Sika Corporation; Construction Products Division.
    j. Tremco Incorporated.
2. Grade: Pourable.
3. Class: 50.
4. Uses Related to Exposure: Traffic.

2.7 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Building Systems.
    b. Bostik, Inc.
    c. May National Associates, Inc.
    d. Pecora Corporation.
    e. Schnee-Morehead, Inc.
    f. Tremco Incorporated.

2.8 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834; application per ASTM C 919. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Manufacturers: Subject to compliance with requirements, provide products manufactured by one of the following:

1. Accumetric LLC; BOXX 824 Acoustical Sound Sealant.
2. BOSS 824 Acoustical Sound Sealant.
3. Grabber Acoustical Sealant GSCS
4. Pecora Corporation.
5. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
6. USG Corporation.

C. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.9 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.10 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation, tolerances, and other conditions affecting joint sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

2. Remove laitance and form-release agents from concrete.

3. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. General: Apply sealant in a neat, weather tight manner. Three (3) sided joints shall be backed with backer rod to provide bond only to two (2) opposite sides.

1. Backer Rod: Polyethylene foam.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

H. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.

I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

J. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer’s written instructions.

K. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix XI in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 JOINT SEALANT SCHEDULE

A. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated.

2. Joint Sealant: Urethane.
3. Joint Sealant Color: As selected by Owner from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.
c. Vertical joints (non-fire-rated) on exposed surfaces of interior unit masonry and concrete walls and partitions.
d. Joints on underside of plant-precast structural concrete beams and planks.
e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
f. Other joints as indicated.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Owner from manufacturer's full range of colors.

C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated.

2. Joint Sealant: Silicone.
3. Joint Sealant Color: As selected by Owner from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Acoustical joints where indicated.
b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Owner from manufacturer's full range of colors.

3.6 CLEANING

A. Remove masking tape.

B. Clean adjacent surfaces soiled by sealant installation.

3.7 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired joint sealants are indistinguishable from the original work.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Standard hollow metal doors and frames.

B. Related Sections include the following:
   1. Division 08 Section “Flush Wood Doors” for wood doors installed in steel frames.
   2. Division 09 Section “Painting” for field painting standard hollow metal doors and frames, and for refinishing salvaged hollow metal frames for reuse.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of hollow metal door and frame and window frame specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard hollow metal doors and frames through one source from a single manufacturer.

C. Fire-Rated Door and Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

   1. Temperature-Rise Limit: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F in 30 minutes of fire exposure.

D. Smoke-Control Door Assemblies: Comply with NFPA 105.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steelcraft.
2. Curries Company.
3. Firedoor Corporation.
4. Mesker Door.
5. Security Metal Products.
6. Approved equal.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 metallic coating.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized.

E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

F. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

G. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

H. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated ,fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard hollow metal door frames of type indicated.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI/SDI A250.

B. Design:
   1. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces door complying with ANSI A250.8.
      a. Fire Door Core: As required to provide fire-protection ratings indicated.

   2. Vertical Edges for Single-Acting Doors: Beveled edge unless square edge is indicated.
      a. Beveled edge: 1/8 inch in 2 inches.

3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick, end closures or channels of same material as face sheets.
4. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical endurance.

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).
2. Width: As indicated on Drawings.

D. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames for Flush Wood Doors.
1. Provide Timely Classic C-Series (18 gauge) frames for flush wood doors.
2. Prime existing frames to remain for field painting.

C. Interior Frames for Hollow Metal Doors: Fabricated from cold-rolled steel sheet unless otherwise indicated.
1. Fabricate interior frames with mitered or coped corners and welded corners and seamless face joints.
2. Steel Sheet Thickness for Interior Doors: 0.053-inch-thick, unless otherwise indicated.
3. Frames for Wood Doors: 0.053-inch-thick, unless otherwise indicated.
4. Frames for Borrowed Lights: 0.053-inch-thick steel sheet.

D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

F. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

G. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.5 FABRICATION

A. General: Fabricate standard hollow metal doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Standard Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Provide where mortar might obstruct hardware operation.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb from 60 to 90 inches high.
2) Four anchors per jamb from 90 to 120 inches high.
3) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Four anchors per jamb from 60 to 90 inches high.
2) Five anchors per jamb from 90 to 96 inches high.
3) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
4) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware include cutouts, reinforcement, mortising, drilling and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.6 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard hollow metal door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard hollow metal doors and frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace standard hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard hollow metal doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Hollow Metal Frames: Install standard hollow metal frames for doors and other openings of size and profiles indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install door silencers in frames before grouting.
    d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    e. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    f. Apply bituminous coating to backs of frames that are filled with mortar, grout and plaster containing anti-freezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division $ Section “Unit Masonry Assemblies.”
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Standard Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Hollow Metal Doors:

   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard hollow metal doors or frames that are warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Salvaging existing flush wood doors for reuse.
2. Solid-core flush wood doors (field installed in steel frames).
3. Factory finishing flush wood doors.

B. Related Sections include the following:

1. Division 08 Section “Hollow Metal Doors & Frames” for wood doors installed in steel frames.
2. Division 08 Section “Glazing” for glass view panels and sidelites.
3. Division 08 Section “Door Hardware” for door hardware for wood doors.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.3 QUALITY ASSURANCE

A. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers**:**

1. Jeld-Wen Windows and Doors.
2. Kolbe Windows and Doors.

3. Algoma Hardwoods Inc.
4. Mohawk Flush Doors, Inc.
5. Approved Equal.

2.2 DOOR CONSTRUCTION, GENERAL

A. Veneer: AWI custom quality wood, plain sliced with book matched hardwood veneer for transparent finish:
   1. Wood: Match Existing.

B. Particleboard Cores: Comply with the following requirements:

   1. Particleboard: ANSI A208.1, Grade LD-1.
   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 at locations where exit devices are indicated.

C. Interior Veneer-Faced Doors:

   1. Core: Structural composite lumber.
   2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

D. Fire-Rated Doors:

   1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
   2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
   3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
   4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

E. Mineral-Core 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 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Louvers: Factory install louvers in prepared openings.

2.4 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. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI conversion varnish system.
3. Staining: VOC content not more than 250 g/L. Custom stain to match wood clad windows stain color. Provide samples of staining for both birch and maple woods. Provide samples of stained door and wood trim.
4. Effect: Semi-filled finish.
5. Sheen: Satin.
6. Color: Match existing.

2.5 SALVAGED DOORS

A. Remove existing flush wood doors and protect from damage until ready for reinstallation.

B. Reinstall wood doors in good shape. Doors deemed not suitable for reuse shall be removed and relocated as directed by client.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors and access panels in corresponding fire-rated frames according to NFPA 80.

C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 34 53

BULLET RESISTANT DOORS AND FRAMNG SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bullet Resistant Doors:
   1. All labor, material, equipment, and related services necessary to furnish and install Bullet Resistant Wood Doors (or Steel Doors with Wood Veneer) and Hollow Metal Frames.

1.2 RELATED SECTIONS

A. Section 08 81 13 – Hollow Metal Doors & Frames.

B. Section 08 71 00 – Door Hardware.

1.3 REFERENCES

A. Underwriters Laboratories (UL) 752 - Bullet Resistance Testing.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Details of core and edge construction.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

B. Shop Drawings:
   1. Submit shop drawings prepared by the manufacturer showing plans, sections, elevations, layouts, profiles and product component locations, including anchorage, bracing, fasteners, accessories and finishes.
   2. Include dimensioned elevation of each type opening assembly in project; indicate sizes and locations of hardware, and lites if specified.

C. Calculations: Submit blast calculations by a qualified blast engineer to substantiate that the system design and anchorage meets or exceeds the minimum performance required.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (152 mm) square, representing actual product, color, and patterns.

E. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

F. Warranty.

G. Maintenance Data.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified with a minimum documented experience of five years.

B. Source Limitations: Obtain bullet resistant doors and framing systems from a single manufacturer.

C. Coordination of Work: Coordinate layout and installation of components with other construction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's unopened, undamaged packaging, with manufacturer's labels intact.

B. Remove wraps or covers from frames upon delivery at the building site; clean and touch-up scratches or disfigurement caused by shipping or handling promptly.

C. Store assemblies covered to protect them from damage but permitting air circulation.

D. Doors should be lifted and carried when being moved, not dragged across one another.

1.7 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

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 absolute limits.

1.9 WARRANTY

A. Manufacturer’s standard form in which manufacturer agrees to repair or replace doors that are deemed defective in materials or workmanship. Conditions are subject to the term set forth in the manufacturer’s warranty.
   1. All material and workmanship shall be warranted against defects for a period of five (5) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Armortex® Inc., which is located at: 5926 Corridor Pkwy.; Schertz, TX 78154; Toll Free Tel: 800-880-8306; Tel: 210-661-8306; Fax: 210-661-8308; Email:request info (rsnelling@armortex.com); Web:www.armortex.com

B. Subject to compliance with requirements, the following additional manufacturers are also

acceptable:

1. Guardian Security Structures (GSS).
2. Approved Equal.

2.2 BULLET RESISTANT DOORS

A. Bullet Resistant Wood Door and Steel Frame:

1. Design Requirements: Provide door and frame assemblies of "non-ricochet type" intended to permit capture and retention of attacking projectile, lessening potential of random injury or lateral penetration.
2. Ballistic Level: 3, tested to UL 752.
3. Material:
   a. Wood: Match existing using quality suitable for transparent finish.
   b. Steel Sheet: ASTM A1008/1008M, cold rolled, free from scale, pitting, coil breaks, and other surface defects.
   c. Bullet resistant Composite: UL Listed Bullet Resistant composite of UL level equal to specified door and frame ballistic protection level.
   d. Hinges: Aluminum continuous gear type.
4. Door Fabrication:
   a. Solid core construction with wood veneer faces, bullet resistant composite core and solid 3/8 inch thick wood stile and rail edges of same species as veneer.
   b. Factory hang doors in frames using specified hinges.
   c. Mortise and reinforce doors and frames at factory to receive hardware in accordance with approved hardware schedule.
5. Frame Fabrication:
   a. Same ballistic protection as doors.
   b. Fabricate from 16 gage steel lined with bullet resistant composite.
   c. Weld frame corners; knock-down and mechanical joints not acceptable.
   d. Welding: In accordance with AWS D1.3/D1.3M. Grind exposed welds flush and smooth.
   e. Allowable Tolerances: Plus or minus 1/16 inch for frame opening width, height, diagonal dimensions, and overall width and height (outside to outside).
6. Door Finish: Unfinished, for field-applied finish refer to Section 09 91 25 - Painting.
7. Frame Finish:
   a. Dress tool marks and surface imperfections to smooth surfaces.
   b. Clean and chemically treat steel surfaces.
   c. Apply manufacturer's standard rust inhibiting gray primer paint.

B. Bullet Resistant Steel Door and Frame Assembly with wood veneer on the door is acceptable as long as it meets ballistic level 3 when tested to UL 752.

2.3 FINISHES

A. Class II, Clear Anodic Finish: AA-M10C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum complying with AAMA 611 and the following:

1. AAMA 607.1
2. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Inspect all doors prior to hanging. Repair noticeable marks or defects that may have occurred from improper storage or handling. Field repairs and touchups are the responsibility of the installing contractor upon completion of the initial installation.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions. Install plumb, level, square, true to line, and without warp or rack. Provide all fasteners required for installation.

B. Anchor frames securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.

C. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.

D. Joint Sealants: Install joint sealants.

E. Adjust door equipment for correct function and smooth operation. Verify water and weather tight installation as applicable.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's representative to verify that installation is in conformance to the manufacturer's recommendations.

3.5 CLEANING

A. Clean surfaces promptly after installation in accordance with manufacturer's instructions.

B. Remove excess joint sealant in accordance with sealant manufacturer's instructions.

C. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

A. Replace doors and frames that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Protect installed products until completion of project.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing and doors.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Failure of operating units.
g. Sealant failure.

B. Wind Loads: As indicated on Drawings.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: 10 seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

C. Samples: For each type of exposed finish required.

D. Maintenance data to include in maintenance manuals.

E. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA Standards for Accessible Design and ICC/ANSI A117.1.

C. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations and dimensions of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to structural failures, including, but not limited to excessive deflection; noise or vibration caused by thermal movements; deterioration of metals, metal finishes and other materials beyond normal weathering; water leakage through fixed glazing and framing areas; failure of operating components.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arch Aluminum & Glass Co., Inc.
2. CMI Architectural.
3. Commercial Architectural Products, Inc.
4. EFCO Corporation.
5. Kawneer North America; an Alcoa company.
6. TRACO.
7. Tubelite.
8. United States Aluminum.
9. Manko.
10. Approved Equal.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: As indicated.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads**,** finished to match framing system.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: As indicated.

    a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide non-removable glazing stops on outside of door.

2.6 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:

    a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.

B. Opening-Force Requirements:

1. Latches and Exit Devices: Not more than 15 lbf required to release latch.

C. Weather Stripping: Manufacturer’s standard bulb-polymeric type.

D. Weather Sweeps: Manufacturer’s standard exterior-door bottom sweep with concealed fasteners on mounting strip.

E. Silencers: BHMA A 156.16, Grade 1.

F. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:3, with maximum height of 1/2 inch. Provide thermally broken thresholds for thermal entrances.

G. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

H. Operating Trim: BHMA A156.6.

I. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

J. Additional hardware specified in Division 08, Section ”Door Hardware.”

2.7 SEALANTS

A. Glazing Sealants: As recommended by manufacturer for joint type, and as follows:

1. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed system manufacturer for this use.

B. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural sealant manufacturer for use in aluminum-framed systems indicated.

C. Provide sealants for use inside of the weatherproofing system that have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Color: As selected by Architect from manufacturer’s full range.

2.8 ACCESSORY MATERIALS

A. Brackets and Reinforcements: Manufacturer’s standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce aluminum members less than 0.125 inch thick to receive fastener threads or provide standard non-corrosive pressed-in splined grommet nuts.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials, which do not bridge thermal breaks.

E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 260 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Air Baffles: Reticulated polymer filter foam with 30 pores per inch.

G. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. Trim, Closures and Fillers: Fabricate to fit tightly to adjoining construction, with weather tight joints at exterior installations, in maximum lengths to minimize joints. Product flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch-wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.

1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
2. Build in straps, plates, and brackets as needed to support and anchor fabrications.
3. Partition Closures: Form closures at partition-mullion abutments from two aluminum sheets, separated by channels of the same material to produce a panel of same thickness as partitions. Incorporate reveals, trim, and concealed anchorages for attaching to adjacent surfaces.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ENTRANCE DOOR HARDWARE SETS

A. See Section 08 7100.

2.11 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A1, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions

affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight sliding door installation.

1. Masonry Surfaces: Visibly dry and free or excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
3. Metal Surfaces: Dry; clean; free of grease, soil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" to produce weather tight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weather tight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

I. Adjust operating hardware for smooth operation according to hardware manufacturer's written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum-framed storefront. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Touch-up minor damage to factory applied finish; where damage has occurred in readily seen areas, replace damaged components. Finishes and surfaces that cannot be satisfactorily repaired or touched up to the Architect's and Owner's approval shall be replaced in-kind.

E. Protect finished work from damage for the duration of the construction period or until acceptance by the Owner.

3.4 ENTRANCE DOOR HARDWARE SETS

A. See Division 08, Section "Door Hardware."

END OF SECTION

SECTION 08 56 13

BULLET RESISTANT HORIZONTAL BAFFLE WINDOW SYSTEM

PART 1 GENERAL

1.1 REFERENCE

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment & ASTM E119-98-Standard Test Methods for Fire Tests of Building Construction and Materials, NIJ Standard 0108.01-(National Institute of Justice) Standard for Ballistic Resistant Protective Materials, ASTM B 209/B 209M- Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate, ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

1.2 SUBMITTALS

A. Submit for approval prior to fabrication: samples, product data (including preparation, storage and installation methods), cuts & anchor spacing, reinforcement & location, product specifications, shop drawings, test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed data in sufficient detail to indicate compliance with the contract documents.

B. Manufacturer's Instructions for installation and cleaning of Horizontal Baffle Window System Assemblies. All required submittals shall be approved prior to installation.

1.3 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the Horizontal Baffle Window System shall be of the "non-ricochet" type. This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration. This assembly shall provide single or multiple transaction positions utilizing the "natural voice" baffle configuration. This design shall employ offset vertical standing vision panels and 5" baffles to complete the "natural voice" design as well as to protect against angled ballistic penetrations. All vision panels and baffles shall be cut to size with all exposed edges polished. Necessary holes shall be pre-drilled and tapped where required. Stainless Steel assembly screws and acrylic spacers shall be provided. Clear anodized angles and channels shall be provided in field lengths. Anchor screws shall be provided by the installer.

B. No field alterations to the construction of the units fabricated under the acceptable standards shall be allowed unless approved by the manufacturer and the architect. Standard manufacturing tolerances shall be +/- 1/16".

C. Materials shall meet or exceed UL 752 requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer shall be a Company that specializes in manufacturing products of the specified type with a minimum of five years experience. Installer shall be a Company that specializes in product type specified and Certified for the installation by the manufacturer. Manufacturer shall provide a mock-up, if required, for evaluation of surface preparation and application workmanship and color/finish to the Architect for approval prior to start of work.

1.5 DELIVERY, STORAGE & HANDLING

A. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

1.6 WARRANTY

A. All materials shall be warranted against defects for a period of 1 year for the date of receipt at the project site. Certificates of manufacturer's standard limited warranty shall be provided at project completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Armortex.
2. Diebold, Inc.
3. Ross Engineering.
4. Total Security Systems.
5. Reed Composites Solutions.
6. Approved Equal.

2.2 BULLET RESISTANT GLAZING PANELS-BAFFLES

A. Basis-of-Design Product shall be: TSS Horizontal Baffle Window system. The Horizontal Baffle Window System consists of custom prefabricated bullet resistant panels with secure air passage as required for voice transmission. Aluminum frame. All accessories for installation to be included. Clear anodized finish.
B. Glazing Panels shall be as shown on the drawings.

1. Bullet Resistant Level 3
   - 1-1/4" LP 1250 Laminated
   - 1-1/4" TSS 003 L/S

C. Frame: Aluminum sections to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized finish to be clear and be free of sharp edges or burrs when in place. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.

1. Frame to be anodized aluminum 18 ga. stainless steel. The bottom of the glazing to be capped with corresponding material on the frame (ie: stainless steel on stainless steel).

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

B. Clean and prepare all surfaces per manufacturer's recommendations for achieving the best results for the substrate under the project conditions.

3.2 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings. Install in accordance with manufacturer’s instructions and UL 752. Set all equipment plumb. All product shall be installed per installation instructions provided by manufacturer, if warranty is to be issued.

B. Horizontal Baffle Window System shall arrive on site as a completed unit. Unit shall be installed in provided opening (wall/door), secured to structure (anchors by others).

3.3 POST APPLICATION

A. Horizontal Baffle Window System shall be installed in accordance with manufacturer’s printed recommendations, including adhering to anchoring and finishing details.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer’s requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

C. Touch-up, repair or replace damaged products before Substantial Completion.

D. Product Warranty: Applicable warranty shall be issued to owner upon final release of completed project.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:

a. Swinging doors.

2. Electronic access control system components, including:

a. Electronic access control devices.

3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
4. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
2. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
3. Division 26 sections for connections to electrical power system and for low-voltage wiring.
4. Division 28 sections for coordination with other components of electronic access control system.

1.02 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

    a. Wiring Diagrams: For power, signal, and control wiring and including:
        1) Details of interface of electrified door hardware and building safety and security systems.
        2) Schematic diagram of systems that interface with electrified door hardware.
        3) Point-to-point wiring.
        4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated, and tagged with full description for coordination with schedule.

a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and Architects hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Quantity, type, style, function, size, and finish of each hardware item.
    d. Name and manufacturer of each item.
    e. Fastenings and other pertinent information.
    f. Location of each hardware set cross-referenced to indications on Drawings.
    g. Explanation of all abbreviations, symbols, and codes contained in schedule.
    h. Mounting locations for hardware.
    i. Door and frame sizes and materials.
    j. Name and phone number for local manufacturer's representative for each product.
    k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
        1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
        1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product data for electrified door hardware:

a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Factory order acknowledgement numbers (for warranty and service)
d. Name, address, and phone number of local representative for each manufacturer.
e. Parts list for each product.
f. Final approved hardware schedule, edited to reflect conditions as-installed.
g. Final keying schedule
h. Copies of floor plans with keying nomenclature
i. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
j. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.04 QUALITY ASSURANCE

A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

4. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.

    a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

B. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC).
2. Can provide installation and technical data to Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

C. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

D. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

G. Keying Conference

1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

    a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

H. Pre-installation Conference

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

I. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer’s original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.

a. Closers:
1) Mechanical: 25 years.

b. Locksets:
1) Mechanical: 10 years.

c. Continuous Hinges: Lifetime warranty.
d. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.08 MAINTENANCE

A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

B. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

D. Cable and Connectors: Hardwired Electronic Access Control Devices:

1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable.
2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.
3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Ives 5BB series.
2. Acceptable Manufacturers and Products: McKinney TB/T4B series, Stanley FBB Series.

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

    a. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

    a. Interior: Heavy weight, steel, 5 inches (127 mm) high

4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

    a. Steel Hinges: Steel pins
    b. Non-Ferrous Hinges: Stainless steel pins
    c. Out-Swinging Exterior Doors: Non-removable pins
    d. Out-Swinging Interior Lockable Doors: Non-removable pins
    e. Interior Non-lockable Doors: Non-rising pins

7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

2.04 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage ND series.
2. Acceptable Manufacturers and Products: Sargent 11-Line.

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

    a. Lever Design: Schlage Sparta.

2.05 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 6000 Series.
2. Acceptable Manufacturers and Products: Folger Adam 300 Series.

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.06 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Field verify existing SFIC keyway to match.

B. Requirements:

1. Provide **interchangeable** cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

C. Construction Keying:

1. Replaceable Construction Cores.

a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
1) 3 construction control keys
2) 12 construction change (day) keys.

b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.07 KEYING

A. Provide cylinders/cores keyed into Owner's existing keying system managed by Owner's locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

a. Master Keying system as directed by the Owner.

2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
3. Provide keys with the following features:

a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)

4. Identification:

a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
b. Identification stamping provisions must be approved by the Architect and Owner.
c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

5. Quantity: Furnish in the following quantities.

a. Change (Day) Keys: 3 per cylinder/core.

b. Permanent Control Keys: 3.
c. Master Keys: 6.

2.08 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer: Telkee.
2. Acceptable Manufacturers: HPC, Lund.

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

    a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
    b. Provide hinged-panel type cabinet for wall mounting.

2.09 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4050 series.
2. Acceptable Manufacturers and Products: Sargent 351 series.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.10 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

    a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.11 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson.
2. Acceptable Manufacturers: Rixson, Sargent.

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.12 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.13 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero International.
2. Acceptable Manufacturers: National Guard, Reese.

B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Size of thresholds:

    a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
    b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width

4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.14 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.15 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: Schlage.
2. Acceptable Manufacturers: GE-Interlogix, Sargent.

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.16 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Continuous Hinges: BHMA 628 (US28)
2. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
3. Protection Plates: BHMA 630 (US32D)
4. Overhead Stops and Holders: BHMA 630 (US32D)
5. Door Closers: Powder Coat to Match
6. Wall Stops: BHMA 630 (US32D)
7. Latch Protectors: BHMA 630 (US32D)
8. Weatherstripping: Clear Anodized Aluminum
9. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing door and frame for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

    a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.

I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Testing and labeling wires with Architect's opening number.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

L. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

O. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

P. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 FIELD QUALITY CONTROL

A. Engage qualified manufacturer trained representative to perform inspections and to prepare inspection reports.

1. Representative will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to

operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.07 DOOR HARDWARE SCHEDULE

A. Hardware items are referenced in the following hardware. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

Hardware Group No. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4050 RW/PA MOUNT ON PULL SIDE	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE AND THE DOOR CONTACT.

Hardware Group No. 02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4050 RW/PA MOUNT ON PULL SIDE	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DESK MOUNT BUTTON	660-PB	628	SCE
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE OR THE DESK MOUNT BUTTON IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE, THE DESK MOUNT BUTTON AND THE DOOR CONTACT.

Hardware Group No. 03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4050 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE AND THE DOOR CONTACT.

Hardware Group No. 04

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	HD DEADLATCH X PADDLE	4900 X 4591	628	ADA
1	EA	SFIC MORTISE CYL.	80-133 X K510-711 36-083	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6223 FSE CON 12/16/24/28 VAC/VDC	630	VON
2	EA	PUSH/PULL BAR	9190HD-12"-NO	630	IVE
2	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
2	EA	PA MOUNTING PLATE	4050-18PA	695	LCN
2	EA	BLADE STOP SPACER	4050-61	695	LCN
1	EA	FLOOR STOP	FS410	626	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. SCHEDULED LOCKING/UNLOCKING IS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE AND THE DOOR CONTACT.

Hardware Group No. 04A

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	HD DEADLATCH X PADDLE	4900 X 4591	628	ADA
1	EA	SFIC MORTISE CYL.	80-133 X K510-711 36-083	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6223 FSE CON 12/16/24/28 VAC/VDC	630	VON
2	EA	PUSH/PULL BAR	9190HD-12"-NO	630	IVE
1	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4050-18PA	695	LCN
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	695	LCN
1	EA	FLOOR STOP	FS410	626	IVE
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. SCHEDULED LOCKING/UNLOCKING IS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE AND THE DOOR CONTACT.

Hardware Group No. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4050 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE AND THE DOOR CONTACT.

Hardware Group No. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4050 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DESK MOUNT BUTTON	660-PB	628	SCE
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE OR THE DESK MOUNT BUTTON IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE, THE DESK MOUNT BUTTON AND THE DOOR CONTACT.

Hardware Group No. 06A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4050 RW/PA MOUNT ON PULL SIDE	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DESK MOUNT BUTTON	660-PB	628	SCE
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE OR THE DESK MOUNT BUTTON IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE, THE DESK MOUNT BUTTON AND THE DOOR CONTACT.

Hardware Group No. 07

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4050 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DESK MOUNT BUTTON	660-PB	628	SCE
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	MULTITECH READER	CARD READER FURNISHED, COMMISSIONED AND INSTALLED BY DIV. 28	BLK	SCE
1	EA	WIRE HARNESS	CON (VERIFY LENGTH AND QUANTITY REQUIRED)	BLK	SCE

CREDENTIAL READER DEVICE OR THE DESK MOUNT BUTTON IS TO RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARM ASSOCIATED WITH THE DOOR CONTACT ALLOWING THE DOOR TO BE OPENED. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
CREDENTIAL READER DEVICE.
REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE, THE DESK MOUNT BUTTON AND THE DOOR CONTACT.

Hardware Group No. 08

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4050 RW/PA MOUNT ON PULL SIDE	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 09

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	SURFACE CLOSER	4050 HCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 10

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 11

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	OH STOP & HOLDER	90F J	630	GLY

Hardware Group No. 12

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70HD SPA	626	SCH
1	EA	SFIC PERMANENT CORE	FIELD VERIFY BRAND AND KEYWAY PRIOR TO BIDDING	626	SCH
1	EA	CORE HANDLING CHARGES	50-231	UNF	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 13

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

FIELD VERIFY THAT SPECIFIED HARDWARE WILL WORK PROPERLY AT EXISTING OPENING (IF REQUIRED).

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal:

1. Unless indicated otherwise, use 25 gauge for partitions up to 12’-0” high. Partitions over 12’-0” high increase stud gage to 20 gauge.
2. Unless indicated otherwise, use 20 gauge studs at door jambs and heads.

C. Slip-Type Head Joints: Where indicated, provide one of the following in thickness not less than indicated for studs and in width to accommodate depth of studs:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) MBA Building Supplies; FlatSteel Deflection Track.
3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
4) Superior Metal Trim; Superior Flex Track System (SFT).
5) Telling Industries; Vertical Slip Track or Vertical Slip Track II.
6) Approved equal.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: As indicated on Drawings.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Depth: As indicated on Drawings.

2.3 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Sound attenuation blankets.
3. Acoustical sealant.
4. Kevlar bullet-resistant fabric (fiberglass bullet-resistant armor on Drawings).

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on the same backing
indicated for Work.

1.3 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

D. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

E. Any piping with insulation shall be boxed out (furred out) even if not shown to be concealed on the Drawings.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Temple-Inland.
b. American Gypsum Co.
c. G-P Gypsum.
d. Lafarge North America Inc.
e. National Gypsum Company.
f. USG Corporation.

B. Regular Type:

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

C. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Type C (as required by specific UL assemblies):

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

E. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

F. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

G. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

H. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; Wonderboard.
b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
c. USG Corporation; DUROCK Cement Board.

2. Thickness: As indicated on Drawings.

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.2 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, or rolled zinc.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. U-Bead: J-shaped; exposed short flange does not receive joints compound.
e. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fry Reglet Corp.
b. Gordon, Inc.

c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide acoustical joint sealant by one of the following manufacturers:
   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
   b. Grabber Construction Products; Acoustical Sealant GSC.
   c. Pecora Corporation; AC-20 FTR.
   d. Specified Technologies Inc.; Smke N Sound Acoustical Sealant.
   e. USG Corporation; SHEETROCK Acoustical Sealant.
   f. Approved Equal.

2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 TEXTURED FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Aggregate Finish: Water-based, job-mixed, aggregated, drying –type texture finish for spray application.

1. Products: Subject to compliance with requirements, provide products by one of the following manufacturers:
   a. G-P Gypsum: Georgia-Pacific Ceiling Textures/Vermiculite.
   b. USG Corporation; SHEETROCK Wall and Ceiling Spray Texture (Aggregated).
   c. Approved equal.
2. Texture: Match existing.

2.6 KEVLAR BULLET-RESISTANT FABRIC (fiberglass bullet-resistant armor on Drawings)

A. Manufacturers: Subject to compliance with requirements, provide Kevlar bullet-resistant fabric from one of the following manufacturers:

1. DuPont.
2. Bulldog Direct Protective Systems.
3. Reed Composites Solutions
4. Approved equal.

B. Locations: Refer to Drawings.

C. Provide sufficient layers to provide bullet resistance to shots fired from a 9 mm gun.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

E. All partitions are to run tight to structure; there may be exceptions noted in the Drawings.

F. If pipes and ducts above ceiling preclude walls or partitions from going full to structure, Contractor shall provide an alternative measure acceptable to Architect at not additional cost. Examples include lath and plaster or other means of preventing the passage of smoke and/or fire.

G. Bulkheads required for piping, etc. will require framing and sheet rock on one or both sides where piping is below typical ceiling heights.

3.2 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: As indicated on Drawings.
2. Type X: Where required for fire-resistance-rated assembly.
3. Type C: As required by specific UL assemblies.
4. Ceiling Type: As indicated on Drawings.
5. Moisture- and Mold-Resistant Type: As indicated on Drawings.

3.3 APPLYING ACOUSTICAL SEALANT

A. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use where indicated.
4. U-Bead: Use where indicated.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view and under wall coverings, unless otherwise indicated.

a. Primer and its application to surfaces are specified in other Division 9 sections.

5. Level 5: Where indicated on Drawings.
   a. Primer and its application to surfaces are specified in other Division 9 Sections.

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.6 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 51 23

ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes acoustical tiles and concealed suspension systems for ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Drawn to scale and coordinating acoustical tile ceiling installation with hanger attachment to building structure and ceiling mounted items. Show size and location of initial access modules.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Tile: Set of 12 x 12 inch square Samples of each type, color, pattern, and texture.
2. Submit two samples each, 6 inches long, of suspension system main runner.

D. Product Test Reports.

E. Maintenance Data.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

B. Fire-Test-Response Characteristics:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

   a. Smoke-Developed Index: 450 or less.

C. Certificates: Submit 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 the Underwriters Laboratories (UL) classification for NRC, CAC, and AC.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 3.0 percent of quantity installed.
2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 3.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 3.0 percent of amount installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and have a stabilized moisture content within the acoustical tile unit manufacturer's recommended limitations.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete and nominally dry, work above ceilings is complete and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

B. Whether shown on Drawings or not, bulkheads will be required where piping, etc. exists below typical ceiling height.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical tiles, and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC

equipment, sprinkler heads and other fire-suppression system components, and partition assemblies.

1.8 WARRANTY

A. Written warranty executed by the manufacturer, agreeing to repair or replacement of acoustical ceilings that fail within the warranty period. Failures include:

1. Acoustical Tiles: Sagging and warping.
2. Grid Systems: Rusting and manufacturer's defects.

B. Warranty Period for Acoustical Tiles: Minimum one year from date of Substantial Completion.

C. Warranty Period for Grid System: Minimum 10 years from date of Substantial Completion.

D. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries
2. USG Interiors.
3. CertainTeed.
4. Approved Equal.

B. Products: See Room Finish List.

C. Proprietary Names: Use of manufacturer's proprietary product names to designate color or materials are not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

2.2 ACOUSTICAL TILE CEILINGS, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

B. Tile-Based Antimicrobial Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial solution that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria.

C. Low-Emitting Materials: Acoustical tile ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension system of types, structural classifications, and finishes indicated that comply with application requirements in ASTM C 635.

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.
3. Chicago Metallic Corporation.
4. National Rolling Mills.
5. Approved Equal.

B. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural, classification and finish indicated which comply with applicable ASTM C 635 requirements. Provide fire resistance rated suspension systems where fire-rated ceilings are required.

C. Access: upward, with each access unit identified by manufacturer's standard unobtrusive markers.

D. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

F. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and designed for attachment to concrete forms and for embedment in concrete, with holes or loops for attachment at hanger wires.

G. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.

H. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

I. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

J. Hold-Down Clips: Manufacturer's standard hold-down clips for grid and edge trim.

K. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical tiles.

L. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G3 coating designation, with pre-finished 15/16-inch-wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. Face Design: Flat, flush.
3. Cap Material: Steel or aluminum cold-rolled sheet.
4. Cap Finish: Painted white.

M. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated, or if not indicated, provide manufacturer's standard molding for corners, edges and penetrations of ceiling that fit type of edge detail and suspension system indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, partitions, walls, and structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage of ceiling system, and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

A. General: Install acoustical tile ceilings to comply with ASTM C 636 UBC Standard 25-2, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

G. Install acoustical tiles with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut tiles at borders and penetrations to provide a neat, precise fit.

1. For square-edged tiles, install tiles with edges fully hidden from view by flanges of suspension system runners and moldings.
2. For reveal-edged tiles on suspension system runners, install tiles with bottom of reveal in firm contact with top surface of runner flanges.
3. For reveal-edged tiles on suspension system members with box-shaped flanges, install tiles with reveal surfaces in firm contact with suspension system surfaces and tile faces flush with bottom face of runners.
4. Paint cut edges of tile remaining exposed after installation; match color of exposed tile surfaces using coating recommended in writing for this purpose by acoustical tile manufacturer.
5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by tile manufacturer's written instructions, unless otherwise indicated.
6. Install clean-room gasket system in areas indicated, sealing each tile and fixture as recommended by tile manufacturer's written instructions.
7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Replace damaged and broken tiles.

B. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Wall base.
   2. Molding accessories.

B. Related Sections include the following:
   1. Division 09 Section “Resilient Plank Flooring.”
   2. Division 09 Section "Tile Carpeting.”

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Johnsonite.
   2. Flexco.
   3. Armstrong.
   4. Approved Equal.

2.2 RESILIENT WALL BASE

A. Resilient Base Standards: ASTM F 1861.
   1. Material Requirement: Type TV (vinyl, thermoplastic).
   2. Manufacturing Method: Group I (solid, homogeneous).
   3. Flexibility: Will not crack, break, or show any signs of fatigue when bent around a 1/4 inch diameter cylinder.
   4. Style: Cove (base with toe).
   5. Meets or exceeds the performance requirements for resistance to heat/light aging, chemicals, and dimensional stability when tested to the methods as described in ASTM F 1861.

B. Thickness: 0.080 inch.

C. Height: 4 inches.

D. Lengths: Coils in manufacturer's standard lengths.

E. Outside Corners: Job formed.

F. Inside Corners: Job formed.

G. Locations: See Drawings.

H. Finish: See Finish List.

I. Colors and Patterns: See Finish List.

2.3 RESILIENT ACCESSORIES

A. Transition Strips:
   1. At dissimilar flooring materials.
   2. At direct glue carpet.
   3. At other locations as indicated.
   4. Color: Match the wall base.

2.3 RESILIENT MOLDING ACCESSORIES

A. Description: Carpet edge for glue-down applications, reducer strip for resilient floor covering, joiner for tile and carpet, transition strips.

B. Material: Vinyl.

C. Profile and Dimensions: As indicated.

D. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
   1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Supart D (EPA Method 24).

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
   1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

E. Areas to receive resilient products shall be clean, fully enclosed, weather tight, and maintained at a uniform temperature of at least 65°F for 24 hours immediately before installation.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 RESILIENT WALL BASE INSTALLATION

A. Comply with manufacturer’s written instructions for installing resilient base.

B. Installation work should not begin until the work of all other trades, especially overhead trades, has been completed.

C. Areas to receive wall base shall be maintained at a uniform temperature of at least 65°F for 24 hours during and for 24 hours after the installation is completed.

D. The wall base and adhesives shall be conditioned in the same manner.

E. Floors and walls shall be clean, dry, free of dust, all paints, wallpaper, and all other foreign materials which may affect proper adhesive bonding.

F. Wall bases shall not be installed on surfaces that will be exposed to drastic temperature changes or moisture.

G. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

H. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

I. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

J. Do not stretch wall base during installation.

K. Vinyl Wall Base: Coiled wall base shall be uncoiled and lay flat for at least 24 hours at 65°F prior to installation.

L. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
   2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.
      a. Do not wash surfaces until after time period recommended by manufacturer.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer. Cover resilient products until Substantial Completion.

END OF SECTION

SECTION 09 65 14

LUXURY VINYL PLANK FLOORING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luxury vinyl plank flooring.

B. Related Sections Include:

1. Division 09 Section “Resilient Wall Base and Accessories” for resilient wall base and other accessories installed with resilient tile flooring.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Store floor coverings and installation materials in dry spaces protected from the weather. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 – PRODUCTS

2.1 LUXURY VINYL PLANK FLOOR COVERING

A. Manufacturers:

1. Armstrong.
2. Interface.
3. Mannington.
4. Mohawk,
5. Tandus Centiva.
6. Approved Equal.

B. Luxury Vinyl Plank Floor Covering: See Finish List.

C. Plank Width & Length: As standard with manufacturer.

D. Colors and Patterns: See Room Finish List.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

E. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Use S-240 Epoxy adhesives.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 – EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by floor covering manufacturer. Proceed with installation only after substrates pass testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor coverings until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.2 FLOOR COVERING INSTALLATION

A. Comply with manufacturer's written instructions for installing floor coverings.

B. Unroll floor coverings and allow them to stabilize before cutting and fitting.

C. Layout floor coverings as follows:

1. Maintain uniformity of floor covering direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.

D. Scribe, cut, and fit floor coverings to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Adhere floor coverings to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor covering.

B. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.

   1. Apply as required by manufacturer.

C. Cover floor coverings until Substantial Completion.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Modular Carpet Tile.

B. Related Sections include the following:

1. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 SUBMITTALS

A. Product Data: For the following, including installation recommendations for each type of substrate:

1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.

B. Samples: For each exposed product and for each color and texture specified.

C. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Carpet type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.

D. Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile and carpet cushion.

E. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer, certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. General Terminology and Information Standard: "Carpet Specifier's Handbook" by The Carpet and Rug Institute (CRI).

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.5 PROJECT CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tile over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.6 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Review methods and procedures related to carpet installation, including:

1. Delivery, storage, and handling procedures.
2. Ambient conditions and ventilation procedures.
3. Subfloor preparation procedures, including relative humidity, moisture and alkalinity tests.

1.7 WARRANTY

A. Special Warranty for Carpet Tile: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fails in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

B. Special Installation Warranty: Installer's written warranty, co-signed by Contractor, agreeing to provide labor and materials to replace carpet tile and accessories that fail due to installation defects, including inadequate subflooring preparation and adhesion failures.

1. Warranty does not include failure due to vandalism or abuse.
2. Warranty Period: Lifetime. Five (5) years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet: Fill-sized tiles equal to five (5) percent of amount installed for each type indicated, but not less than 10 square yards.

B. All usable pieces of carpet tile remaining after completion of the work shall be left with the Owner at the Project Site.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Manufacturers:

1. Interface.
2. Mohawk.
3. Shaw.
4. Or Approved Equal.

B. Products: See Room Finish List for Basis-of-Design Product.

C. All carpet shall be the same mill run throughout.

D. Antimicrobial Treatment: Manufacturer's standard.

2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet cushion manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Vinyl Transition Strips: Vinyl transition strip of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet and cushion manufacturer.
2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tiles.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile and cushion manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. Comply with CRI 104, Section 104 and with carpet tile manufacturers' written installation instructions for the following:

1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, “Direct Glue-Down Installation.”

B. Comply with carpet tile manufacturer's written recommendations for seam locations and direction of carpet tile; maintain uniformity of carpet tile direction and lay of pile. At doorways, center seams under the door in closed position.

C. Do not bridge building expansion joints with carpet tile.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

G. Install pattern parallel to walls and borders.

H. All selvages shall be trimmed to ensure good side seams. All seams shall receive an 1/8” continuous bead of seam adhesive at the point the face yarn enters the back. Fit edges together with an invisible seam and bond with appropriate adhesive.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer and carpet tile adhesive manufacturer.

END OF SECTION

SECTION 09 91 25

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Gypsum Board.
2. Wood.
3. Hollow Metal Frames.
4. And as indicated on Drawings.

B. “Paint” as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers and other applied material whether used as prime, intermediate or finish coats.

C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

D. The following categories are not included as part of field-applied finish work:
1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified.
2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces in concealed areas and generally inaccessible areas.
3. Finished metal surfaces.
4. Operating parts.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.3 SUBMITTALS

A. Paint: Submit a list of specified products with corresponding name of manufacturer, identifying name and number of proposed products along with manufacturer's written instructions for use of each product.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

C. Prepare and repaint an area of each designated interior surface to requirements specified herein, with specified paint or coating showing selected color, gloss/sheen, texture and workmanship to MPI Repainting Manual standards for review and approval by Owner and Architect. When approved, interior surface shall become acceptable standard of finish quality and workmanship for similar on-site repainting of work.

D. VOC Content Submittal: For all interior paints, product data including printed statement of VOC content.

1.4 QUALITY ASSURANCE

A. Master Painters Institute (MPI) Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
    a. For areas to be renovated, comply with requirements in "MPI Maintenance Repainting Manual."

B. Source Limitations:

1. Obtain primers for each coating system from the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver materials to site until having received all written approvals of submitted information and samples.

B. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

8. VOC content.

C. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Keep storage area neat and orderly. Remove oily rags and waste daily.

D. Take all precautions to insure that workers and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and applications of paint.

1.6 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 SEQUENCING AND SCHEDULING

A. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto newly-painted surfaces.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that are from the same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than one (1) gallon of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. AFM Safecoat.
2. Benjamin Moore & Co.
3. Cabot.
4. ICI/Dulux.
5. PPG Architectural Finishes, Inc.

6. Sherwin-Williams Company.
7. U-C Coatings Corp.
8. Target Coatings.
9. Diamond Vogel Paint.
10. Approved Equal.

2.2 MATERIALS

A. Use the materials of the same manufacturer for each system.

B. Sherwin Williams systems are called out in the system schedules to establish quality and dry mil thickness of finished installation for all systems. A different manufacturer may be used for color selection. Any manufacturer noted above may be used as long as quality and color requirements are met.
   1. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

C. Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers.

D. Material Compatibility:

   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

E. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

   1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
   2. Nonflat Paints, Coatings and Primers: VOC content of not more than 150 g/L.
   3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   4. Restricted Components:

      a. Acrolein.
      b. Acrylonitrile.
      c. Antimony.
      d. Benzene.
      e. Butyl benzyl phthalate.
      f. Cadmium.
      g. Di (2-ethylhexyl) phthalate.
      h. Di-n-butyl phthalate.
      i. Di-n-octyl phthalate.
      j. 1,2-dichlorobenzene.

k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

F. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

2.3 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

2.4 METAL PRIMERS

A. Rust-Inhibitive Primer (Water-Based): MPI #107.

2.5 LATEX PAINTS

A. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).

B. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).

C. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).

D. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

2.6 EQUIPMENT

A. Provide all brushes, rollers, ladders, scaffolding and other equipment of any kind to properly execute each type of work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

B. Maximum Moisture Content of Substrates:

1. Gypsum Board: 12 percent.
2. Wood: 15 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

E. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as specified for each particular substrate condition.

1. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting operations.
    a. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved. Remove surface-applied protection, if any.
    b. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

    Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning.
2. Remove dirt, rust, scale, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

B. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

C. Gypsum Board: Fill minor irregularities with patching material and sand to smooth level surfaces taking care not to raise nap of paper.

D. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. San surfaces exposed to view smooth and dust off.

E. Existing Ferrous Metal

1. Spot remove failed, damaged or rough existing paint to bare metal by means of stripping as indicated above. If existing metal surface is not smooth, sand or wire brush
   a. Sand edges of existing paint to a feather edge.
2. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer and clean cloths.

F. Ferrous Metal

1. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer and clean cloths.
2. Where not galvanized, shop coat of primer will exist on surface. If prime coat is not smooth, sand to bare metal and re-prime.

3.3 APPLICATION

A. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

B. Do work under adequate illumination and dust-free conditions.

C. Apply paint according to manufacturer's written instructions.

1. Use applicators and techniques best suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

D. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

E. Materials.

1. Do not open containers until required for use.
2. Stir materials thoroughly and keep at uniform consistency during application.

F. Coats

1. Number specified is minimum.
2. Touchup suction spots between coats.

3. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
4. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
5. Refinish surfaces affected by refitting work.

3.4 COLOR SEPARATION

A. An average of one or two wall colors will be used per room. Ceilings generally will be a different color than walls. Finished closets will usually be the same as adjoining rooms.

B. Job painted metal items such as diffusers, grilles, and registers will generally be the same color as the adjacent surface.

3.5 CLEANING

A. During the progress of this work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each workday.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.7 INTERIOR PAINT SCHEDULE

A. In addition to obvious surfaces, the following do not require painting or finishing:
1. Do not include painting when factory-finishing or installer-finishing is specified for such items (but not limited to) acoustic materials, finished mechanical and electrical equipment, including light fixtures and distribution cabinets.
2. Painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, utility tunnels, pipe spaces, and duct shafts.
3. Do not paint over any code-required labels, such as Underwriter’s Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plate.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Latex-Eggshell; Zero VOC.
    a. One coat “Harmony Interior Latex Primer.”
    b. Two coats “Harmony Interior Latex Eggshell.”
    c. Colors: See Room Finish List.

C. Steel Substrates:

1. Ferrous Metal: Latex; semi-gloss.
    a. One coat “Pro-Cryl Universal Primer.”
    b. Two coats “ProClassic Waterborne.”
    c. Color Schedule: See Room Finish List.

3.8 STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Natural-Finish Woodwork: Provide the following natural finishes over new interior woodwork;

1. Waterborne Acrylic Clear Over Stain System: MPI INT 6.3Q.
    a. Two finish coats of waterborne clear acrylic varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.

END OF SECTION

SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Horizontal louver blinds with perforated aluminum slats.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

C. Samples: For each exposed finish.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Flame-Resistance Ratings: Passes NFPA 701.

B. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, PERFORATED ALUMINUM SLATS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Hunter Douglas.
2. Levolor.
3. Springs Window Fashions Division, Inc.
4. Bali by Springs Window Fashions Division.

5. Approved Equal.

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.

1. Width**:** One (1) inch wide**.**
2. Finish: White.

a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
b. Reflective Coating: Manufacturer's special coating enhancing the reflection of solar energy on the outside-facing slat surface.

C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and ends.

D. Bottom Rail: Formed-steel or extruded-aluminum tube, with plastic or metal capped ends.

E. Ladders: Braided string Manufacturer’s standard width cloth tapes or polyester yarns, evenly spaced to prevent long-term slat sag and colored to match blinds.

F. Tilt Control: Enclosed worm-gear mechanism and linkage rod.

G. Lift Cords: Manufacturer’s standard.

H. Lift Operation: Manual.

I. Valance: Manufacturer’s standard.

J. Mounting: As required.

K. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard, as indicated.

L. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

A. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows:

1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
2. Blind Units Installed outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail and operating hardware, and for hardware position and blind mounting method indicated.

D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

E. Color-Coated Finish:

1. Metal: For components exposed to view, apply manufacturer's standard baked finish.

F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 1 inch to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.

B. Flush Mounted: Install horizontal louver blinds with slat edges flush with finish face of opening if slats are tilted open.

C. Jamb Mounted: Install headrail flush with face of opening jamb and head.

D. Head Mounted: Install headrail on face of opening head.

E. Recessed: Install headrail concealed within blind pocket.

F. Connections: Connect motorized operators to building electrical system.

G. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

H. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.

END OF SECTION

SECTION 12 35 30

CASEWORK AND COUNTERTOPS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plastic-laminate cabinets.
2. Solid-surfacing-material countertops and backsplashes.
3. Solid-surfacing-material window sills. (Remove existing and replace with new.)

1.2 SUBMITTALS

A. Product Data: For cabinets, countertop materials, cabinet hardware and accessories, adhesives, and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components. Include countertop layout for each location, details of countertop construction, including backsplash and edge details, and type of core substrate materials. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures. Field measure.

C. Samples: For each type of material exposed to view.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who specialize in fabricating products similar to those required for this Project and whose products have a record of successful in-service performance with a minimum of three (3) years documented experience. Accepted by the manufacturer as an acceptable installer.

B. Field Measurements: Verify dimensions of construction to receive countertops and window sills by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Manual of Millwork."

1.4 COORDINATION

A. Coordinate work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver casework items only when proper storage conditions will be available. Store casework in protected area until ready for installation.

B. Maintain optimum humidity and temperature conditions after receipt of materials.

C. Store in manner to allow free circulation of air around all items.

D. Maintain temperature of casework storage areas between 50 to 75 degrees Fahrenheit.

PART 2 – PRODUCTS

2.1 PLASTIC-LAMINATE CABINETS

A. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
   a. Wilsonart International.
   b. Formica Corp.
   c. Pionite.
   d. Nevamar Company.
   e. Approved Equal.

2. Colors, Patterns and Finishes: See Room Finish List.

B. Cabinet Hardware and Accessories:

1. General: Provide manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.
2. Pulls: Surface mounted decorative pulls.
3. Hinges: Concealed butt hinges.
4. Drawer Guides: Epoxy-coated metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

2.2 SOLID-SURFACING-MATERIAL COUNTERTOPS, BACKSPLASHES AND WINDOW SILLS

A. Solid-Surfacing Material: Homogeneous filled polyester, acrylic-modified, cast-polymer solid surface. Colors and patterns run all the way through the product. A repairable and renewable surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
   a. Avonite, Inc.
   b. Corian; Dupont.
   c. E. I. du Pont De Nemours and Company.
   d. Formica Corp.
   e. Nevamar Company.
   f. Swan Corporation.
   g. Wilsonart International.
   h. Vendura
   i. Approved Equal.

2. Colors, Patterns and Finishes: See Room Finish List.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.4 FABRICATION

A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

1. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal edges of openings in countertops with a coat of varnish.

B. Plastic-Laminate Cabinets
1. AWI Type of Cabinet Construction: Flush overlay.
2. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:
   a. Horizontal Surfaces Other Than Tops: Grade HGS.
   b. Post Formed Surfaces: Grade HGP.
   c. Vertical Surfaces: Grade HGS.
   d. Edges: Grade HGS.
3. Materials for Semi-Exposed Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
4. Drawer Slides and Backs: Thermoset decorative panels.
5. Drawer Bottoms: Thermoset decorative panels.
6. Colors, Patterns, and Finishes: As selected by Architect from manufacturer's standard range.
7. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

C. Plastic-Laminate Supports/Aprons:
1. AWI Type of Cabinet Construction: Flush overlay.
a. Horizontal Surfaces Other Than Tops: Grade HGS.
b. Post formed Surfaces: Grade HGP.
c. Vertical Surfaces: Grade HGS.
d. Edges: Grade HGS.
2. Materials for Semi-exposed Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
3. Colors, Patterns, and Finishes: As selected by Architect from manufacturer's standard range.

D. Solid-Surfacing Countertops and Backsplashes:
1. Use molds, materials, methods and procedures that will result in proper texture and finish.
2. Fabricate to required dimensions. To the greatest extent possible, fabricate each unit in one piece. Provide shop-applied backsplashes. Comply with solid-surface material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
3. All surfaces to be uniform matte. All edges to be erased and sanded smooth.
4. Cure components prior to shipment and remove traces of material that may be toxic or incompatible with other building materials.
5. Colors, Patterns, and Finishes: As selected by Architect from manufacturer's standard range.

E. Solid-Surfacing Window Sills:

1. 1/4-inch-thick solid polymer material with returned ends and 1/2-inch lipovers.
2. Undermount EPS insulation.
3. See Room Finish List for color and style.

PART 3 – EXECUTION

3.1 DELIVERY

A. Store and install in a ventilated building not exposed to extreme temperature and/or humidity.

3.2 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-ins associated with work in this Section.

3.3 INSTALLATION

A. Install components plumb, level, true and straight according to approved Shop Drawings and manufacturer's published installation instructions. Shim as required with concealed shims.

B. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strip, scribe strips, and molding in finish to match cabinet face.

C. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.

D. Fasten cabinets to adjacent units and to backing.

1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or handing strips.
2. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with toggle bolts through metal backing behind gypsum board.

E. Fasten solid-surfacing-material countertops by screwing through corner blocks of base units into underside of countertop. Align adjacent surfaces and form seams to comply with manufacturer's written instructions using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

F. Install backsplashes where indicated on Drawings. Adhere to countertops with construction adhesive approved by manufacturer. Caulk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

G. Install window sills as shown on Drawings and as specified by manufacturer. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved Shop Drawings and product data.

H. Provide all necessary fillers, panels, end panels, scribes required to make complete installation as detailed.

I. Prior to final inspection, examine installation of the work of this section. Repair or replace all defects found. Leave installation clean, undamaged, and ready for use.

3.4 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean countertops and backsplashes as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

B. Repair damages and defective work.

C. Use no acids or harsh abrasives.

D. Leave surfaces clean and without defects.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SCOPE

A. This section includes information common to two or more technical fire protection specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:
   1. PART 1 - GENERAL
      a. Scope
      b. Related Work
      c. Related Documents
      d. Regulatory Requirements
      e. Reference Standards
      f. Quality Assurance
      g. Abbreviations and Symbols
      h. Definitions
      i. Coordination
      j. Protection of Finished Surfaces
      k. Sleeves and Openings
      l. Sealing and Firestopping
      m. Off Site Storage
      n. Submittals
      o. Operating and Maintenance Instructions
      p. Record Drawings
      q. Training of Owner Personnel
      r. Testing
      s. Cleaning
      t. Warranty
   2. PART 2 - PRODUCTS
      a. Access Panels and Doors
      b. Pipe Penetrations
      c. Identification
      d. Equipment Accessories
      e. Gauges
      f. Sealing and Firestopping
   3. PART 3 - EXECUTION
      a. Openings, Cutting and Patching
      b. Building Access
      c. Equipment Access
      d. Coordination of Work
      e. Pipe Penetrations
      f. Identification
      g. Sleeves

1.2 RELATED WORK

A. Provisions of Division 01 shall govern work under this Section.

B. This section applies to all Division 21 Sections of Fire Suppression.

1.3 REGULATORY REQUIREMENTS

A. Refer to Division 01 of the Project Manual.

B. Codes and Standards:
1. Fire Protection work shall conform to the requirements of Wisconsin Building Code (COMM), NFPA Standards, and local regulations regarding design, materials and installation.
2. Materials and workmanship shall comply with applicable Codes, local ordinances, industry standards and utility regulations. In case of differences between Codes, and the Contract Documents, the most stringent shall govern.

C. Non-Compliance:
1. Should the Contractor perform any work that does not comply with the above requirements, he shall bear all costs necessary to correct the deficiencies.
2. Permits, Inspections, and Fees:
3. Request and obtain permits and inspection appointments.
4. Provide fees and charges for approvals, reviews, or other inspections.
5. Include copies of the certificates in the Operating and Maintenance Instructions.
6. Fees and charges assessed by local utilities for water or other services shall be included in the bid.

1.4 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in this and other sections are as follows:
1. ANSI American National Standards Institute
2. ASME American Society of Mechanical Engineers
3. ASPE American Society of Plumbing Engineers
4. ASTM American Society for Testing and Materials
5. AWWA American Water Works Association
6. AWS American Welding Society
7. CS Commercial Standards, Products Standards Sections, Office of Engineering Standards Service, NBS
8. DSPS State of Wisconsin Department of Professional Services
9. EPA Environmental Protection Agency
10. FM Factory Mutual System
11. FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
12. IAPMO International Association of Plumbing & Mechanical Officials
13. IEEE Institute of Electrical and Electronics Engineers
14. ISA Instrument Society of America
15. MCA Mechanical Contractors Association
16. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.

17. NBS National Bureau of Standards
18. NEC National Electric Code
19. NEMA National Electrical Manufacturers Association
20. NFPA National Fire Protection Association
21. UL Underwriters Laboratories Inc.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 of the Project Manual.

B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

1.6 ABBREVIATIONS AND SYMBOLS

A. Key to abbreviations and symbols shall be on the Drawings.

B. The following are additional abbreviations used in the Specifications:
1. A/E Architect/Engineer
2. GC General Contractor
3. PC Plumbing Contractor
4. FPC Fire Protection Contractor
5. HC Heating Ventilating and Air Conditioning Contractor
6. EC Electrical Contractor

1.7 DEFINITIONS

A. Furnish:
1. Supply and deliver to Project site ready for unpacking, assembly and installation

B. Install:
1. Operations at Site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting related devices required for product fully functional for intended use after installation.

C. Provide:
1. Furnish and install, such that product is fully functional for intended use.

1.8 COORDINATION

A. The Drawings show the general arrangement of piping and equipment and shall be followed as closely as actual building construction and the work of other trades permits. Architectural and Structural Drawings shall take precedence. Because of the scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required.

1.9 PROTECTION OF FINISHED SURFACES

A. Refer to Division 01, of the Project Manual.

1.10 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.11 OFF SITE STORAGE

A. Refer to Division 01 of the Project Manual.

1.12 SUBMITTALS

A. Refer to Division 01, of the Project Manual.

B. Submit shop drawings with space for approval stamps of GC and A/E.

C. Refer to Division 01, of the Project Manual.

D. Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to submit the following fire protection system data sheet. List piping material types, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves, specialties and equipment with manufacturer and model number. The approved fire protection system data sheet(s) will be made available to the Owners Project Representative for their use on this project.

FIRE PROTECTION SYSTEM DATA SHEET

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Hangers & Supports			
Sprinkler Heads			
Valves			
Specialty Valves			
Pipe Specialties			
Fire Protection Specialties			

E. Shop drawing submittals are to be bound in a three ring binder, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

F. Submittals shall be sent to the local Fire Chief or Fire Marshal for review prior to the Architect/Engineer. Include copy of approval letter in submission to Architect/Engineer.

G. Submit plans indicating water supply location and size, piping layout and size, sprinkler locations and type, hanger locations and type, equipment locations and type, valve locations and type, occupancy classes, hydraulic reference points, design areas and discharge densities.

H. Submit hydraulic calculations for water supply and sprinkler systems. Include summary sheet and detailed work sheets. Describe characteristics of water supply and location of effective point used in calculations. Include graph illustration of water supply, hose demand, and sprinkler demand.

I. Submit sufficient quantities of data sheets and shop drawings to allow the following distribution:
   1. Operating and Maintenance Manuals 2 copies
   2. Architect/Engineer 2 copies
   3. Local Fire Chief or Marshal 1 copy

J. Firestop Systems:
   1. Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01 of the Project Manual.

B. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:
   1. Copies of all approved submittals along with approval letters.
   2. Manufacturer's wiring diagrams for electrically powered equipment.
   3. Records of tests performed to certify compliance with system requirements.
   4. Certificates of inspection by regulatory agencies.
   5. Parts lists for equipment and specialties.
   6. Manufacturer’s installation, operation and maintenance recommendations for equipment and specialties.
   7. Valve schedules
   8. Lubrication instructions, including list/frequency of lubrication
   9. Warranties

10. Additional information as indicated in the technical specification sections

1.14 RECORD DRAWINGS

A. Refer to Division 01 of the Project Manual.

B. In addition to the data indicated in the General Requirements, maintain fire protection layout record drawings and hydraulic calculations on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings and calculations with the Operating and Maintenance manuals.

1.15 TRAINING OF OWNER PERSONNEL

A. Instruct Owner's personnel in the proper operation, maintenance and testing of systems and equipment provided as part of this project. Include not less than 2 hours of instruction, using the Operating and Maintenance manuals and record drawings during this instruction.

1.16 TESTING

A. Equipment, material and labor required for testing, shall be provided by the Contractor.

B. Contractor shall notify Inspector(s) one day prior to the time when the test is ready to be performed. Contractor shall notify the A/E of date and time for tests.

C. After the test, indicate in writing the time, date, name and title of the person approving the test. This shall also include the description and what portion of the system has been tested. The person approving the test shall sign the certification.

D. Records shall be maintained of testing that has been completed and shall be made available at the job site to authorities.

E. Upon completion of the work, records and certifications approving testing requirements shall be submitted.

F. Defective work or material shall be replaced or repaired, and the test repeated. Repairs shall be made with new materials.

1.17 CLEANING

A. Contractor shall keep the premises broom clean and free of all surplus materials, rubbish and debris which is caused by his employees or resulting from his work.

B. Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers, motors, devices, switches, and panels.

C. Identification plates on equipment shall be free of paint and dirt.

D. The Contractor shall leave his portion of the work ready for operation.

1.18 WARRANTY

A. Warrant that work functions for one year following acceptance of the system(s).

B. The Contractor shall keep the system in good working order at no expense, unless defects are clearly the result of improper or abnormal usage.

C. The Contractor shall submit to the A/E upon request for acceptance of the work, written certification that the entire system has been installed and adjusted for operation in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 ELECTRICAL REQUIREMENTS

A. General:
   1. Work shall conform to requirements of Division 26.
   2. Provide wiring diagrams.

2.2 ACCESS PANELS AND DOORS

A. Provide access panels at locations requiring access to mechanical equipment. Locations include, but are not limited to areas above drywall ceilings, shaft enclosures and other furred in spaces concealing valves, ducts or equipment. Provide UL listed, fire rated access panels when penetrating fire rated chase or shaft areas.

B. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12 inch by 12 inch for hand access and 24 inch by 24 inch for body access.

C. Panels shall be Milcor brand or equivalent.

D. Panels shall include concealed hinges, cam type locking devices, and have frame/border type necessary for particular wall or ceiling construction they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, able to accept field painting for general applications and stainless steel for use in toilet rooms, shower rooms and similar wet areas.

E. Refer to Architectural Room Finish Schedule for wall and ceiling surfaces and finishes.

F. For non-security applications, panel construction shall utilize 16 gauge frame with not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

2.3 PIPE PENETRATIONS

A. Refer to Division 01 requirements as well as the following.

B. Fire, Smoke And Fire/Smoke Rated Surfaces:

C. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta Foam Products Insta Fire Seal Firestop Foam or Dow Corning Fire Stop System.

D. All fire stopping systems shall be provided by the same manufacturer.

E. UL listed or tested by independent testing laboratory, approved by State and Local Code jurisdictions.

F. Use product that has a rating not less than rating of wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

G. Sleeves in concrete to be Schedule 40 steel pipe with integral water stop unless fire stop material used includes a sleeve that is an integral part of rated assembly.

H. Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

I. Non Rated Surfaces:
   1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.
   2. At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effectively seal. Use galvanized sheet metal sleeves in hollow wall penetrations.

2.4 EQUIPMENT, PIPING AND VALVE IDENTIFICATION

A. Equipment Labels:
   1. After painting and covering, identify equipment, including pumps, tanks, compressors, and control panels. Locate identification conspicuously.
   2. Identification of equipment shall be by engraved white letters on a black 1/16 inch thick plastic laminate panel, beveled edges, screw mounting, permanently attached to the equipment.

B. Minimum size:
   1. 3/4" x 2 1/2" with 3/8" letters.

C. Manufacturers:
   1. Setonply ® Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

D. Pipe Identification:
   1. Pipe identification shall conform to ANSI A13.1 "Scheme for Identification of Piping Systems".

2. Printed labels identifying the fluid conveyed and direction of flow shall be attached to pipes in accessible locations, at intervals not to exceed 20 feet, not less than once in each room, at each branch, adjacent to each access door or panel, at each valve and where exposed piping passes through walls and floors.

Outside Diameter of Pipe Covering	Minimum Size of Letters
up to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1½"

3. Manufacturers:
   a. EMED Co., Seton Name Plate Company, or W. H. Brady.
4. Stencils:
   a. Not less than 1 inch high letters/numbers for marking pipe and equipment.

E. Valve Tags:
1. Identify each valve by means of 1½" diameter brass tag fastened to body of valve with copper or brass chain. Identification number shall be stamped thereon with letters a minimum of ½" high. System identification abbreviation shall be stamped with letters a minimum of ¼" high.
   a. The following prefixes shall be used:
   b. SPKR Sprinklers
2. Manufacturers:
   a. EMED Co., Seton Name Plate Company, or W. H. Brady.

F. Valve Charts:
1. Furnish three charts listing each valve. Two charts shall be delivered to A/E. An additional chart shall be framed behind glass and hung in location selected by Owner. Charts shall show the following:

Valve number	Size
Manufacturer	Type of valve
Type of service	Location

2. Furnish typewritten chart indicating equipment or areas served by each numbered valve and incorporate in Operating and Maintenance Manuals.

2.5 EQUIPMENT ACCESSORIES

A. Provide equipment accessories, connections, and incidental items.

B. Install piping connecting to pumps and other equipment without strain at the piping connection. If requested by the A/E, remove the bolts in these flanged connections, or disconnect piping, to demonstrate that piping has been properly connected.

2.6 GAUGES

A. Acceptable Manufacturers:

1. American, Taylor, Trerice, U.S. Gauge, Weiss, or Winters Instruments.

B. Pressure Gauges:
1. Industrial quality with phosphor bronze bourdon tube, brass socket, 3½ inch dial face, bronze bushed movement, aluminum case with black finish, white background, black figures readable by person standing on floor.

C. Ranges shall be as follows:
1. Fire Protection Water:
a. 0 to 200 psig

PART 3 - EXECUTION

3.1 GENERAL

A. Coordination Of Work:

B. Review the complete set of Drawings and Specifications and report discrepancies to the A/E. Obtain written instructions for changes necessary. Coordinate with each trade prior to beginning installation and make provisions to avoid interferences. Changes required caused by neglect to coordinate shall be made without expense to the project.

C. Piping shall not be located above electrical panels.

D. Anchor Bolts, Sleeves, and Supports:
1. These items required for the Work shall be furnished by the FPC for proper installation of his work. They shall be installed (except as otherwise specified) by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them. Expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor for the trade with responsibility for directing their proper location.

E. Adjustments In Locations:
1. Locations of pipes and equipment shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

F. Right Of Way:
1. New lines which pitch shall have the right of way over those which do not pitch. For example: Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of conflicts.
2. Offsets, transitions and changes in direction of electrical raceways, pipes, and ducts shall be made to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings.

3.2 OPENINGS, CUTTING AND PATCHING

A. Refer to Division 01 requirements.

B. Provisions for openings including chases, holes and clearances through walls, floors, and roof, ceilings and partitions shall be made in advance of construction of each part of the building. Openings shall (except for pipe sleeves) be provided by the GC for the respective materials in which openings occur, during the construction of the building with the exception of pipe sleeves. Furnish required opening dimensions and locations.

C. If the FPC neglects to inform the GC of his opening requirements before that portion of the building is complete, the FPC shall cut the openings, provide framing and lintels. In the event holes must be cut through reinforced concrete, drill so as to avoid spalling and unnecessary damage or weakening of structural members. No chopping or breaking out is permitted. Before cutting or drilling, the Contractor shall obtain permission from the A/E. Patch adjacent materials and repair damage resulting from the cutting.

3.3 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.4 EQUIPMENT ACCESS

A. Install all piping, valves, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor.

B. Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color coded thumb tacks or screws, depending on surface, for use in accessible ceilings.

3.5 COORDINATION OF WORK

A. Install systems, equipment and piping in cooperation with other trades. Locations of pipes, equipment, fixtures, etc., shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

B. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

C. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

D. Offsets, transitions and changes in direction of electrical raceways, pipes and ducts shall be made as required whether or not indicated on the Drawings.

E. Provide appropriate sections of work with required wall, roof and floor opening locations and dimensions. If Contractor neglects to coordinate information, openings shall be the responsibility of Contractor.

3.6 PIPING INSTALLATION

A. Installation Arrangement:
   1. Install work to permit removal (without damage to other parts) of parts requiring replacement or maintenance. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, and control components and to clear the openings of swinging and overhead doors and of access panels.

B. Connections Different From Those Shown:
   1. Where equipment requiring different arrangement or connections from those shown is used, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications. When requested by the A/E, submit drawings showing the proposed installation.
   2. Upon approval of the revisions, make changes in piping, ductwork, supports, insulation, wiring, and panelboards. Provide additional motors, controllers, valves, fittings and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including required changes in affected trades. The Contractor shall be responsible for the proper location of rough in and connections by other trades.
   3. Changes shall be made at no increase in the Contract amount or additional cost to the other trades.

3.7 SLEEVES

A. Provide galvanized sheet metal sleeves for fire rated pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In existing poured concrete walls where penetration is core drilled, pipe sleeve is not required. Grout holes directly around steel pipe.

B. In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 3/4 inch above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

3.8 PIPE PENETRATIONS

A. General:
   1. Coordinate location of building surface penetrations with appropriate contractors. Furnish sleeves, inserts, and devices to be built into structure to contractor performing Work. Prepare Shop Drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until Shop Drawings are approved.

B. Fire Rated Surfaces:
   1. Install products in accordance with the manufacturer's instructions where pipe penetrates a fire rated surface. When pipe is insulated, use product that maintains integrity of insulation and vapor barrier. Where sleeve must be installed in existing floor, grout area around sleeve to restore floor integrity. In wet area floor penetration, top surface of penetration to be 2 inches above adjacent floor with additional height obtained by means of concrete pad poured integral with floor.

C. Non Rated Surfaces:
   1. Install escutcheons or floor/ceiling plates where pipe penetrates non fire rated surfaces in occupied spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required when insulation completely covers wall opening and insulation end is trimmed in a neat manner. Occupied spaces for this Paragraph include only those rooms with finished ceilings and penetration occurs below ceiling.
   2. Install galvanized sheet metal sleeve in hollow wall penetrations to provide backing for sealant. Apply sealant to both sides of penetration in a manner that annular space between pipe sleeve and pipe or insulation is completely blocked.

D. Completely seal (or caulk) around pipe penetrations through non-rated, smoke tight corridor walls in healthcare facilities. Refer to architectural drawings for additional information.

E. Completely seal pipe penetrations, as specified below, for walls of the following rooms below:
   1. Non-fire rated mechanical rooms
   2. Isolation rooms
   3. Computer rooms
   4. Conference rooms
   5. Private offices

3.9 ESCUTCHEON PLATES

A. Provide plates on pipes passing through finished floors, walls and ceilings, with outside diameter to cover sleeve opening and inside diameter to fit snugly around pipe. Set tight to building surface. Escutcheon plates shall be chromium plated metal.

3.10 PAINTING

A. Refer to Division 09.

3.11 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.

B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

C. Identify interior piping mains not less than once every 25 feet, not less than once in each room, adjacent to each access door or panel, and on both sides of the partition where exposed piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background or approved pipe marking label systems.

D. Identify valves with signs per NFPA rulings.

E. Provide hydraulic design information sign of permanently marked weatherproof metal or engraved nameplate material. Secure to main fire risers/valves with brass chain. Information to include location of the design areas, discharge densities, required flow and residual pressure at the base of riser, hose stream demand and sprinkler demand.

END OF SECTION

SECTION 21 05 29

HANGERS AND SUPPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for supports of all fire protection equipment and materials as well as piping system anchors. Included are the following topics:
   1. PART 1 - GENERAL
      a. Scope
      b. Related Work
      c. Reference Standards
      d. Quality Assurance
      e. Description
      f. Design Criteria
      g. Submittals
   2. PART 2 - PRODUCTS
      a. Manufacturers
      b. Structural Supports
      c. Pipe Hangers and Supports
      d. Beam Clamps
      e. Riser Clamps
      f. Concrete Inserts
      g. Anchors
      h. Equipment Stands
      i. Corrosive Atmosphere Coatings
   3. PART 3 - EXECUTION
      a. Installation
      b. Hanger and Support Spacing
      c. Riser Clamps
      d. Concrete Inserts
      e. Anchors

1.2 RELATED WORK

A. Provisions of Division 01 shall govern work under this Section.

B. Section 21 05 00 – Common Work Results for Fire-Suppression

C. Section 21 10 00 – Water-Based Fire-Suppression Systems

1.3 REFERENCE STANDARDS

A. MSS SP-58

B. MSS SP-69

C. NFPA 13 Installation of Sprinkler Systems (Latest prevailing addition).

D. UL Underwriters' Laboratories Listed.

E. FM Factory Mutual Approved

1.4 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 of the Project Manual.

1.5 DESCRIPTION

A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.

B. Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.

C. Fasteners depending on soft lead for holding power or requiring explosive powder actuation will not be accepted.

D. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

1.6 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

B. Materials and application of pipe hangers and supports shall be in accordance with NFPA rulings and be UL/FM listed and approved.

C. Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

1.7 SUBMITTALS

A. Submit data in accordance with Section 21 05 00 and Division 01 of the Project Manual.

B. Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service. Provide details on the working drawings submitted for approval with all pertinent information listed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. B-Line, Fee and Mason, Grinnell, Hilti, Michigan Hanger, Pate, PHD Manufacturing, Piping Technology, Powers/Rawl, Proset, Roof Products & Systems, Unistrut, or Victaulic.

2.2 STRUCTURAL SUPPORTS

A. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

2.3 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2" through 4":
   1. Carbon steel, adjustable swivel ring with 3/8" min. UL/FM approved hanger rods. B-Line B3170NF, Grinnell 69 or 70.
   2. Carbon steel, adjustable clevis, standard, with UL/FM approved size hanger rods. B-Line B3100, Grinnell 260.

B. Hangers for Pipe Sizes 4" Through 8":
   1. Carbon steel adjustable swivel ring with ½" min. UL/FM approved hanger rods. B-Line B3170NF, Grinnell 69 or 70.
   2. Carbon steel, adjustable clevis, standard with UL/FM approved size hanger rods. B-Line B3100, Grinnell 260.

C. Multiple or Trapeze Hangers:
   1. Manufactured steel channel system with manufacturers slotted interlocking pipe clamps with screw/nut securing and threaded hanger rods or steel channels with welded spacers and threaded hanger rods.
   2. Steel channel, 12-gauge thickness, Dura-Green epoxy coating, B-Line B11. Restrain individual pipes with B-Line B2000 series or Vibraclamp series strut clamps.

D. Wall Support:
   1. Carbon steel welded bracket with hanger. B-Line 3060 Series, Grinnell 190 Series.
   2. Steel channels with pipe clamps.

E. Vertical Support:
   1. Carbon steel riser clamp. B-Line B3373, Grinnell 261 for above floor use. Grinnell 40 with bolts and concrete anchors for attachment to underside of concrete floor deck.

F. Floor Support:
   1. Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

G. Copper Pipe Supports:
1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Grinnell PS 1400 series.

2.4 PIPE HANGER RODS

A. Steel Hanger Rods:
1. Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts. Steel, electro-plated, threads on both ends, B-Line B3205
2. Size rods for individual hangers and trapeze support as indicated in the following schedule:

Pipe Size:	Diam. Of Rod:
Up to and Including 4"	3/8" or 9.5mm min.
5",6" and 8"	½" or 12.7mm min.

2.5 BEAM CLAMPS

A. MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.

B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell 228.

2.6 CONCRETE INSERTS

A. Poured in Place:
1. MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Grinnell 281.
2. MSS SP-69 Type 18 universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N, Grinnell 282.

B. Drilled Fasteners:
1. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Powers/Rawl, Redhead.

2.7 ANCHORS

A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.8 EQUIPMENT SUPPORT

A. Support equipment plumb, rigid, and true to line. Examine Drawings, and manufacturer's data to determine how equipment and piping are to be supported, mounted, or suspended. Provide rods, bolts, inserts, pipe stands, brackets and accessories for proper support.

B. Equipment Stands:
   1. Use structural steel members welded to and supported by pipe supports. Clean, prime and coat with three coat rust inhibiting alkyd paint or one coat epoxy mastic. Where exposed to weather, treat with corrosive atmosphere coatings.

2.9 CORROSIVE ATMOSPHERE COATINGS

A. Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface each side. Mechanical galvanize threaded products, ASTM B695 Class 50, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich paint of comparable thickness to factory coating.

B. Corrosive atmospheres include the following locations:
   1. Chemical storage and hazardous waste storage rooms

PART 3 - EXECUTION

3.1 INSTALLATION

A. Size, apply and install supports and anchors in compliance with manufacturers recommendations.

B. Secure pipe in place to prevent vibration, maintain proper slope and provide for expansion and contraction.

C. Design supports of strength and rigidity to suit loading, service, and manner which do not unduly stress the building construction. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing wherever practical. Do not use another pipe for support. Do not use perforated iron, chain or wire as hangers.

D. Use inserts for suspending hangers from reinforced concrete slabs wherever practical. Where inserts are not practical, provide channels or angles from which to suspend hangers/supports. Fasten structural steel to concrete with expansion bolts.

E. Provide expansion anchors in concrete slabs for installation of threaded support rods.

F. Provide hangers capable of vertical adjustment after piping is erected. Do not pierce ductwork with hanger rods. On threaded support rods and bolts, weld nuts to rods, peen threads, or provide double set of nuts with lock washers to prevent loosening. Use beam clamps for attaching hangers to structural steel.

G. Coordinate hanger and support installation to properly group piping of all trades.

H. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.

I. Perform welding in accordance with standards of the American Welding Society.

3.2 HANGER AND SUPPORT SPACING

A. Support horizontal piping per NFPA 13.

B. Provide vertical support at each floor level as the pipe passes through the floor. For piping that does not pass through the floor, provide adequate support to stabilize the vertical portion of the piping.

C. Provide galvanized steel supports for steel piping.

D. Provide CPVC dipped hangers or provide Unistrut "Uni-Cushion" vinyl strip at galvanized hangers for copper lines.

E. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

G. Adjust hangers to obtain the slope specified in the piping section of these specifications.

H. Space hangers for pipe as follows:

Pipe Material:	Pipe Size:	Max. Horiz. Spacing:	Max. Vert. Spacing:
Copper	3/4" through 1"	8'-0"	10'-0"
Copper	1-1/4" through 1-1/2"	10'-0"	10'-0"
Copper	2" through 3"	12'-0"	10'-0"
Copper	3-1/2" through 8"	15'-0"	10'-0"
Steel	1" through 1-1/4"	12'-0"	15'-0"
Steel	1-1/2" through 8"	15'-0"	15'-0"

I. Unsupported length from the last hanger and an end sprinkler shall be as follows:

Pipe Size:	Length:
1" piping	Not greater than 36"
1-1/4" piping	Not greater than 48"
1-1/2" piping	Not greater than 60" or larger

3.3 RISER CLAMPS

A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor. Use method of securing the vertical risers to the building structure below in stairwell locations.

3.4 ANCHORS

A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

SECTION 21 10 00

WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for an Automatic Fire Sprinkler System for this project. Included are the following topics:
   1. PART 1 – GENERAL
      a. Scope
      b. Related Work
      c. Reference Standards
      d. Description
      e. System Description
      f. Design Standards
      g. Quality Assurance
      h. Submittals
   2. PART 2 – PRODUCTS
      a. Pipe
      b. Fittings
      c. Joints
      d. Valves
      e. Flow Switches
      f. Tamper Switches
      g. Sprinklers
      h. Flexible Sprinkler Drop Fittings
      i. Miscellaneous Equipment
   3. PART 3 – EXECUTION
      a. Installation
      b. General
      c. Valves
      d. Gauges
      e. Switches
      f. Sprinklers
      g. Flexible Sprinkler Drop Fittings
      h. Testing

1.2 RELATED WORK

A. Applicable provisions of Division 01 shall govern work under this Section.

B. Section 21 05 00 – Common Work Results for Fire-Suppression

C. Section 21 05 29 – Hangers and Supports for Fire-Suppression Piping and Equipment

1.3 REFERENCE STANDARDS

A. Applicable provisions of Division 01 shall govern work under this section.

B. Local and State Codes and Regulations.

C. National Fire Codes (NFC) published by NFPA; latest edition of standards listed:

D. NFPA 13 Sprinkler Systems

E. Local Fire Department requirements.

F. All items to be UL listed or FM approved for intended usage.

1.4 DESCRIPTION

A. Fire Protection Contractor shall furnish all calculations, design, drawings, material, equipment, labor and related items required to complete the work indicated on drawings and specifications.

B. The work under this Section includes, but is not limited to the following:
   1. Provide all components for a complete wet pipe automatic sprinkler system including shutoff valves with supervisory switch, test valve(s), piping, and all necessary components to make a complete, operational, and approved system.
   2. Provide complete, approved automatic sprinkler system(s) to give fire suppression coverage to all areas/rooms in renovation.

C. This portion of the project is design build. The contractor shall follow the specifications for type of systems, materials and equipment to use.

D. The contractor will be the Engineer of Record and shall prepare, seal and submit drawings and calculations as required to obtain approval and building permit from State, Insurance Company, and local authority. Submit drawings and calculations to all authorities as required.

E. These documents, along with local regulations and codes, will be the basis for the Fire Protection design and construction.

F. The contractor shall calculate, size and select all systems as defined by the documents. This shall include coordination with other trade contractors including wiring of flow switch(es) and supervisory switch(es). All calculations, sizes, and system layouts shall include provisions for future additions.

1.5 SYSTEM DESCRIPTION

A. Provide a wet pipe automatic sprinkler riser, cross main, and branch piping to connect to sprinkler heads in all spaces of the renovation. Connect to existing sprinkler main. See Fire Protection Drawings for location of main, riser, and Fire Department Connection.

1.6 DESIGN STANDARDS

A. Sprinkler system shall be designed and hydraulically calculated by the Contractor to provide densities as indicated below and listed on the drawings. Hydraulically calculate the system based on Light Hazard Occupancy in general areas.

B. Design system for the most hydraulically remote area based on the following:

Space Type/ Location:	Occupancy Classification	Density (GPM/Ft²)	Area (Ft.²)	Hose (GPM)	Max Vel. (Ft./Sec.)	Duration (Min.)
Common Areas	Light Hazard	0.10	1,500	100	20	60
Office Spaces	Light Hazard	0.10	1,500	100	20	60
Storage	Ordinary (Group 1)	0.15	1,500	250	20	90

C. Available water supply data for system design is as follows:
1. Test Date: November 2, 2016, 2 pm
2. Performed By: City of Madison Water Utility

Water Supply Hydrant Location	Outlet Elevation	Flow (GPM)	Static (PSI)	Residual (PSI)
Wilson St. HYDRA- 5150-18	903 ft	1230	64	50

D. Water test data is preliminary for bidding purposes. Contractor shall perform a field flow and pressure test on municipal water supply main to verify existing conditions, as well as conditions of any new municipal main installation, in the adjacent street, and obtain any additional test data required for design. Tests to be representative of high water use periods.

E. Contractor shall submit seven (7) copies of hydraulic calculations with shop drawings on standard form specified in NFPA No. 13, Chapter 7, Sections 7 2 through 7 3.5 inclusive and Figures A 7 3.3 and A-7 - 3.4.

1.7 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Section 21 05 00 and Division 01 of the Project Manual.

B. Fire protection system components shall be rated for a minimum operating pressure of 175 psig.

C. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

1.8 SUBMITTALS

A. Shop Drawings:
1. Submit shop drawings of all fire sprinkler system components.

B. Plans:
1. Submit contractor-prepared plans/drawings.

2. Submit per NFPA 13; installation plans, working plans, shop drawings, hydraulic calculations, and manufacturer's data on devices, etc., indicating by model and number to be used for review and approval. Contractor shall obtain the necessary insurance underwriters, State and Local Fire Department approvals prior to submitting shop drawings. Include copy of approval letter in submission to Architect/Engineer.
3. Prepare drawings at minimum scale of 1/8” per foot for plans and 1/4" per foot or larger for details. Show all piping, lighting, equipment, ductwork, sprinklers, hangers, roof construction and occupancy of each area, including ceiling and roof heights.
4. Installation shall be coordinated with the latest architectural, structural, mechanical, plumbing and electrical drawings.
5. Contractor shall submit drawings to Engineer which have been reviewed and stamped "approved" by the authority having jurisdiction. No work shall commence until all approvals have been obtained. Allow sufficient time in the construction schedule for the approvals.

C. As Built Drawings:
1. Maintain at the site an up to date marked set of as built drawings which shall be corrected and delivered to the Architect upon completion of the work.
2. Furnish the Architect one (1) reproducible print of corrected shop drawings, including plans, revised to show "as built" conditions.

PART 2 - PRODUCTS

2.1 PIPE

A. Wet Systems:
1. Carbon steel pipe, black, thickness per NFPA 13, conforming to ASTM A53, A135, A795.
2. Sprinkler piping shall be schedule 40 threaded up to and including 2” in size.
3. Schedule 10 threaded light wall not allowed (2” and under).

2.2 FITTINGS

A. Malleable iron, Class 150, threaded, ANSI B16.3.

B. Ductile iron, grooved end, 300 lb/in2 working pressure rating, UL listed or FM approved for automatic sprinkler.

C. Ductile or malleable iron, plain end with EPDM gasket, carbon steel bolts or locking lugs UL listed or FM approved for automatic sprinkler, Grinnell "Sock it".

D. Carbon steel, butt-welded, class 150, ASTM A234.

E. Carbon steel, Class 150, flanged, ASTM A105.

F. Fittings used on galvanized piping shall have galvanized finish.

2.3 JOINTS

A. Iron Pipe:
   1. Tapered pipe threads, with Teflon tape, ANSI B2.1.
   2. Mechanical coupling, EPDM gasket, UL listed or FM approved for automatic sprinkler.

B. Rigid Type:
   1. Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. Tongue and recess rigid type couplings shall only be permitted if the contractor uses a torque wrench for installation. Required torque shall be in accordance with the manufacturer's latest recommendations. Victaulic FireLock® EZ Style 009H (2" thru 4") and Victaulic Style 107H QuickVic™ (2" thru 8") shall be installation ready stab-on design, for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. 10" and larger sizes shall be Victaulic Style 07 Zero-Flex standard rigid coupling.

C. Flexible Type:
   1. Use in seismic areas and where required by NFPA 13. Victaulic Style 177 QuickVic™ (2" thru 8") shall be installation ready stab-on design, for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. 10" and larger sizes shall be Victaulic Style 75 or 77 standard flexible coupling.

2.4 VALVES

A. Manufacturers:
   1. Grinnell, Nibco, TYCO, Victaulic, or Wilkins.

B. Shutoff Valve:
   1. Butterfly Valve:
      a. Ductile iron body, epoxy coated, EPDM encapsulated ductile iron disc, 300 psi maximum working pressure, indicating type, with tamper switch in actuator, grooved end connections, UL Listed or FM approved, Victaulic Figure 705-W.

C. Check Valve:
   1. Ductile iron body, rubber-encapsulated disc, 250 psi maximum working pressure, grooved end connections. Victaulic style 717.

D. Test Drain Valve:
   1. Ball valve type, bronze, combination test and drain, with site glass, Sure-Test by G/J Innovations.
   2. If design flow cannot be reached through the inspector's test drain, then the FPC shall install forward flow by-pass around the fire department connection check valve.

2.5 FLOW SWITCHES

A. UL listed and FM approved vane type waterflow switch with metal enclosure, adjustable pneumatic retard and electrical characteristics compatible with alarm system. Equal to Potter Model VSR-F.

2.6 TAMPER SWITCHES

A. For O S & Y valve or post indicator installations, UL listed, FM approved, to monitor position of valve, tamper resistant cover screws, single or double SPDT switch contacts, corrosion resistant, for indoor or outdoor use, NEMA 4 & 6P enclosures. Equal to Potter Model PCVS-1, -2 and OSYSU-1, 2.

2.7 SPRINKLERS

A. Manufacturer:
   1. Products of the following manufacturers determined to be equal by the Architect/Engineer will be accepted: Grinnell, Reliable, TYCO, Victaulic and Viking.

B. General:
   1. Fusible link or glass bulb type, cast brass or bronze construction. Provide heads with nominal 1/2" discharge orifice except where greater than normal density requires large orifice.
   2. Select fusible link or glass bulb temperature rating to not exceed maximum ambient temperature rating allowed under normal conditions at installed location. Provide ordinary temperature (165 degree) fusible link or glass bulb type except at skylights, sealed display windows, unventilated attics and roof spaces, over cooking equipment, adjacent to diffusers, unit heaters, uninsulated heating pipes or ducts, mechanical rooms, storage rooms, or where otherwise indicated.
   3. Provide quantity of spare heads as noted below and 1 wrench for each type of head and each temperature range installed. Provide 6 spare heads per 300 or less installed heads, 12 per 1000 or less and 24 for more than 1000. Provide steel cabinet for storage of heads and wrenches.

C. Types:
   1. Refer to Sprinkler Schedule on plans for sprinkler head types and finishes in each area. Provide sprinkler guards in areas where sprinklers may be subject to damage (i.e. mechanical rooms).

D. Finished Areas:
   1. Chrome plated bronze body quick response pendent, concealed, or side-wall sprinklers with glass bulb heat sensor. Semi-recessed and sidewall sprinklers shall have adjustable recessed escutcheon. Concealed sprinklers shall have adjustable cover plates. Cover plates shall match ceiling color. Design Basis: Victaulic Model V27.

E. Unfinished Areas:
   1. Plain bronze body, upright or pendent, quick response sprinklers, with solder link or glass bulb for wet system. Plain bronze, upright or pendent open sprinkler for dry system. Design Basis: Victaulic Model V27 or V36.

F. Ratings:
   1. See sprinkler ratings indicated on Sprinkler Schedule on plans. Use higher temperature-rated sprinkler heads in areas near heat sources, elevator equipment rooms, and elevator shafts.

2.8 FLEXIBLE SPRINKLER DROP FITTINGS

A. Manufacturers: FlexHead Industries, Victaulic or Viking.

B. Corrugated Type 304 stainless steel hose with braided Type 304 stainless steel exterior cover, welded stainless steel or zinc plated steel inlet and outlet threaded fittings with EPDM seals. 175 PSI pressure rating. 225 oF temperature rating, 1" minimum internal hose diameter. 40" maximum hose length, straight or angle outlet configuration. Galvanized steel ceiling support bar and brackets selected to match project ceiling support system requirements. UL Listed and FM approved.

C. Flexible drops are only allowed for use above fully accessible ACT ceilings.

2.9 MISCELLANEOUS EQUIPMENT

A. Provide other equipment and accessories, not listed, but required for a complete sprinkler system in accordance with NFPA and FM requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install sprinkler system in accordance with requirements of NFPA 13 and local regulations of the fire marshal.

B. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

C. The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.

3.2 GENERAL

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of window, doorway, stairway or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of fire protection piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, ceiling grid layout, light fixtures and grilles before installing piping. All exposed overhead piping shall be installed above the bottom chord of roof joists.

B. Maintain piping in clean condition internally during construction.

C. Provide clearance for access to valves and piping specialties.

D. Install piping so that system can be drained. Where possible, slope to main drain valve. Piping may be installed level (WET SYSTEMS ONLY). Where piping cannot be fully drained, install nipple and cap for drainage of less than 5 gallons or valve/nipple/cap for drainage over 5 gallons.

E. Do not install piping within exterior walls.

F. Do not route piping above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

3.3 VALVES

A. Properly align piping before installation of valves. Do not support weight of piping system on valve ends. Mount valves in locations which allow access for operation, servicing and replacement. Install all valves with the stem in the upright or horizontal position. Valves installed with the stems down will not be accepted. All system shut-off valves shall have a supervisory switch.

3.4 GAUGES

A. Provide a valved pressure gauge in main sprinkler risers.

3.5 SWITCHES

A. Provide valved test connection for flow switch adjacent to flow switch. Test flow switch to verify proper operation.

3.6 SPRINKLERS

A. Locate sprinklers maintaining clearances from obstructions, ceilings and walls. Install sprinklers level in locations not subject to spray pattern interference.

B. Sprinklers shall be centered in all ceiling panels and tiles. A 1” tolerance for sprinkler placement is acceptable.

3.7 FLEXIBLE SPRINKLER DROP FITTINGS

A. Install in accordance with manufacturer’s installation instructions following minimum bend radii, maximum number of bends and bend distance from end requirements.

3.8 TESTING

A. Refer to Section 21 05 00 – Common Work Results for Fire Suppression.

B. Hydro-statically pressure test the fire sprinkler system piping as required in NFPA 13. Keep records of all testing for submission in Operation and Maintenance Manuals.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SCOPE

A. This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:
   1. PART 1- GENERAL
      a. Scope
      b. Related Work
      c. Regulatory Requirements
      d. Reference Standards
      e. Quality Assurance
      f. Abbreviations and Symbols
      g. Definitions
      h. Coordination
      i. Electronic Drawings
      j. Continuity of Existing Services
      k. Protection of Finished Surfaces
      l. Sealing and Firestopping
      m. Equipment Furnished by Others
      n. Off Site Storage
      o. Submittals
      p. Specified Materials and Equipment
      q. Equipment Installation
      r. Operating and Maintenance Manuals
      s. Record Drawings
      t. Training of Owner Personnel
      u. Testing
      v. Cleaning
      w. Warranty
   2. PART 2 - PRODUCTS
      a. Electrical Requirements
      b. Access Panels and Doors
      c. Pipe Penetrations
      d. Equipment, Piping, and Valve Identification
      e. Equipment Accessories
   3. PART 3 – EXECUTION
      a. General
      b. Asbestos Abatement
      c. Demolition
      d. Openings, Cutting and Patching
      e. Building Access
      f. Equipment Access

g. Coordination of Work
h. Piping Installation
i. Sleeves
j. Pipe Penetrations
k. Escutcheon Plates
l. Painting
m. Identification

1.2 RELATED WORK

A. Applicable provisions of Division 01 govern work under this Section.

B. This section applies to all Division 22 sections of plumbing.

1.3 REGULATORY REQUIREMENTS

A. Codes and Standards
1. All plumbing work shall conform to the requirements of Wisconsin Administrative Code SPS 382 and SPS 384, Wisconsin Uniform Plumbing Code.
2.
3. All materials and workmanship shall comply with applicable Codes, local ordinances, industry standards and utility regulations. In case of differences between such Codes, and the Contract Documents, the most stringent shall govern. Promptly notify the A/E in writing of any such difference.

B. Non Compliance:
1. Should the Contractor perform any work that does not comply with the above requirements, without having notified the A/E, he shall bear all costs necessary to correct the deficiencies.

C. Permits, Inspections and Fees:
1. All required, permits, and inspections shall be requested and obtained by the Contractor.
2. All fees and charges for approvals, reviews, or other inspections shall be paid by the Contractor.
3. All fees and charges assessed by local utilities for water, sewer, gas or other services shall be included in the bid and shall be paid by the Contractor(s).

1.4 REFERENCE STANDARDS

A. Standards cited in the Specifications shall be the most recent editions.

B. Abbreviations of standards organizations referenced in this and other sections are as follows:
1. AGA American Gas Association
2. ANSI American National Standards Institute
3. ASME American Society of Mechanical Engineers
4. ASPE American Society of Plumbing Engineers
5. ASSE American Society of Sanitary Engineering
6. ASTM American Society for Testing and Materials
7. AWWA American Water Works Association

8. AWS American Welding Society
9. CISPI Cast Iron Soil Pipe Institute
10. CGA Compressed Gas Association
11. CS Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
12. EPA Environmental Protection Agency
13. FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
14. GAMA Gas Appliance Manufacturers Association
15. IAPMO International Association of Plumbing & Mechanical Officials
16. IEEE Institute of Electrical and Electronics Engineers
17. ISA Instrument Society of America
18. MCA Mechanical Contractors Association
19. MICA Midwest Insulation Contractors Association
20. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
21. NBS National Bureau of Standards
22. NEC National Electric Code
23. NEMA National Electrical Manufacturers Association
24. NFPA National Fire Protection Association
25. NSF National Sanitation Foundation
26. PDI Plumbing and Drainage Institute
27. UL Underwriters Laboratories Inc.

C. Standards referenced in this section:
1. ACI 614 Recommended Practice for Measuring, Mixing and Placing of Concrete
2. ASTM D1557 Standard Test Method for Moisture-Density Relations of Soils
3. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
4. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
5. UL1479 Fire Tests of Through-Penetration Firestops
6. UL723 Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 of the Project Manual.

B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

1.6 ABBREVIATIONS AND SYMBOLS

A. Key to abbreviations and symbols shall be on the Drawings.

B. The following are additional abbreviations used in the Specifications:
   1. A/E Architect/Engineer
   2. GC General Contractor
   3. PC Plumbing Contractor
   4. FPC Fire Protection Contractor
   5. HC Heating Ventilating and Air Conditioning Contractor
   6. EC Electrical Contractor

1.7 DEFINITIONS

A. Furnish:
   1. Supply and deliver to Project site ready for unpacking, assembly and installation.

B. Install:
   1. Operations at Site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting related devices required for product fully functional for intended use after installation.

C. Provide:
   1. Furnish and install, such that product is fully functional for intended use.

1.8 COORDINATION

A. The Drawings show the general arrangement of piping and equipment and shall be followed as closely as actual building construction and the work of other trades permits. Architectural and Structural Drawings shall take precedence. Because of the scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate conditions affecting the Work and arrange accordingly, providing offsets, fittings and accessories as may be required to meet conditions.

1.9 ELECTRONIC DRAWINGS

A. Drawings in electronic format will be made available to successful Plumbing contractor at a non-refundable cost specified under Division 01 of Specifications. If no cost is specified in Division 01, default cost shall be $75 per drawing. Drawings provided may or may not be updated to reflect Addenda items. Use of Drawings is limited to this Project and may not be forwarded to any other party for any purpose. Use of files will be at Contractor’s sole risk and without liability or legal exposure to JDR Engineering, Inc or its employees. Architectural drawings or any other drawings not produced by JDR Engineering will not be provided.

1.10 PROTECTION OF FINISHED SURFACES

A. Refer to Division 01 of the Project Manual.

B. Furnish one can of touch-up paint for each different color factory finish to be finished surface of product. Deliver touch-up paint with other "loose and detachable parts" as covered in General Requirements.

1.11 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.12 EQUIPMENT FURNISHED BY OTHERS

A. Drawings indicate equipment to be furnished or installed by Others. When providing utility connections, coordinate exact requirements, including quantity, location, elevation size, material, flow and pressure.

1.13 OFF SITE STORAGE

A. Refer to Division 01 of the Project Manual.

1.14 SUBMITTALS

A. Refer to Division 01, of the Project Manual.

B. Submit shop drawings with space for approval stamps of GC and A/E.

C. Submit the following plumbing system data sheet for approval by the GC and A/E. List piping material type for each piping service on the project, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves and specialties for each piping service, fixture and equipment with manufacturer and model number.

PLUMBING SYSTEM DATA SHEET

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Unions			
Valves:			
Ball			
Butterfly			
Balancing			
Check			
Hangers & Supports			
Insulation			
Plbg. Specialties:			
Cleanouts			
Water Hammer Arrestors			
Backflow Preventers			
Ice Maker Boxes			

Plbg. Fixtures:
Sink
Faucet
Stop/Supplies
Waste/Trap

D. Submit manufacturer's color charts where finish color is specified to be selected by Architect/Engineer.

E. Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Include wiring diagrams of electrically powered equipment.

F. Submit sufficient quantities of data sheets and shop drawings to allow the following distribution:
1. Operating and Maintenance Manuals 2 copies
2. Architect/Engineer 2 copies
3. Local Fire Chief or Marshal 1 copy

G. Firestop Systems:
1. Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

1.15 SPECIFIED MATERIALS AND EQUIPMENT

A. Design is based on equipment specified by manufacturer and model number as specified on Drawing Schedules. Where certain items are specified by manufacturer or trade name, Contractor's bid shall be based on use of named item. Where one (1) make is described and other makes are listed, comparable models of other named equipment may also be used, provided they meet requirements of Specifications.

B. When equipment or accessories used differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those on Drawing schedules, Contractor shall be responsible for costs involved in integrating equipment or accessories into system. Contractor shall be responsible for obtaining original design performance from system into which items are placed, regardless of whether manufacturer/model is specified equivalent or substitute.

C. If Contractor wishes to use items other than those named in Specifications in base bid, request for approval of substitution must be made in writing to A/E at least 14 days prior to opening of bids. Include complete technical and descriptive data with request. If approved, an Addendum will be issued notifying bidders of approval. Request for approval will be considered only if requested by prime bidding Contractor.

1.16 EQUIPMENT INSTALLATION

A. Drawings show general arrangement and location of equipment and appurtenances. It is Contractor's responsibility to install equipment in a location and manner that allows for proper service and maintenance access to equipment. Work shall generally conform to requirements shown on Drawings. However, location of equipment may require field adjustments to obtain required service space. DO NOT SCALE OFF PLANS to determine proper location of equipment. Because of scale of Drawings, it is not possible to indicate exact routing of piping, and offsets, fittings and accessories required to provide proper service access to equipment. Contractor shall route and install ductwork and piping to provide required service access to equipment.

B. If, during construction phase of Project, contractor feels inadequate space exists, or equipment locations must be substantially modified to provide proper service and maintenance access, prior to installing equipment, contractor shall notify engineer in writing, outlining general concerns and proposed modifications. Equipment installed without providing manufacturer's required maintenance and service clearance shall be considered defective. Contractor shall remove and relocate piping, ductwork and equipment, to provide required service clearances at contractor's expense.

1.17 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01 of the Project Manual.

B. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

1. Copies of all approved shop drawings.
2. Manufacturer's wiring diagrams for electrically powered equipment
3. Records of tests performed to certify compliance with system requirements
4. Certificates of inspection by regulatory agencies
5. Parts lists for fixtures, equipment, valves and specialties.
6. Manufacturer's installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties.
7. Valve schedules
8. Lubrication instructions, including list/frequency of lubrication
9. Warranties
10. Additional information as indicated in the technical specification sections

1.18 RECORD DRAWINGS

A. Refer to Division 01 of the Project Manual.

B. Maintain Record Drawings on daily basis to be turned over at completion of Project.

1.19 TRAINING OF OWNER PERSONNEL

A. Instruct Owner's personnel in proper operation and maintenance of systems and equipment provided as part of Project, using Operating and Maintenance manuals during instruction. Demonstrate startup and shutdown procedures for equipment. Training shall be during normal working hours.

1.20 TESTING

A. Provide materials, labor, and equipment required for testing.

B. Notify Inspector(s) one day prior to the time when the test is ready to be performed.

C. After testing, submit in writing the time, date, name and title of the person approving the test. This shall also include the description and what portion of the system has been tested. The person approving the test shall sign the submittal.

D. Records shall be maintained of testing that has been completed and shall be made available at the job site.

E. Upon completion of the work, records and certifications approving testing requirements shall be submitted.

F. Defective work or material shall be replaced or repaired, and the test repeated. Repairs shall be made with new materials.

1.21 CLEANING

A. Keep the premises broom clean and free of surplus materials, rubbish and debris.

B. After fixtures and equipment have been installed, remove stickers, rust stains, labels, and temporary covers.

C. Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers, motors, devices, switches, fixtures, and panels.

D. Identification plates on equipment shall be free of paint and dirt.

E. Leave the work in a condition ready for operation.

1.22 WARRANTY

A. Warrant that work shall function for one year immediately following acceptance of the system(s).

B. Keep the system in good working order at no expense, unless defects are clearly the result of improper or abnormal usage.

C. Submit for acceptance of the work, written certification that the entire system has been installed and adjusted for operation in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 ELECTRICAL REQUIREMENTS

A. General:
   1. Work shall conform to requirements of Division 26.
   2. Power wiring shall be provided by the EC. Control wiring shall be provided by the PC. Plumbing Contractor shall provide wiring diagrams for use by the Electrical Contractor.

2.2 ACCESS PANELS AND DOORS

A. Provide access panels at locations requiring access to mechanical equipment. Locations include, but are not limited to areas above drywall ceilings, shaft enclosures and other furred in spaces concealing valves, ducts or equipment. Provide UL listed, fire rated access panels when penetrating fire rated chase or shaft areas.

B. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12 inch by 12 inch for hand access and 24 inch by 24 inch for body access.

C. Panels shall be Milcor brand or equivalent.

D. Panels shall include concealed hinges, cam type locking devices, and have frame/border type necessary for particular wall or ceiling construction they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, able to accept field painting for general applications and stainless steel for use in toilet rooms, shower rooms and similar wet areas.

E. Refer to Architectural Room Finish Schedule for wall and ceiling surfaces and finishes.

F. For non-security applications, panel construction shall utilize 16 gauge frame with not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

2.3 PIPE PENETRATIONS

A. Refer to Division 01 requirements as well as the following.

B. Fire, Smoke And Fire/Smoke Rated Surfaces:
   1. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta Foam Products Insta Fire Seal Firestop Foam or Dow Corning Fire Stop System.
   2. All fire stopping systems shall be provided by the same manufacturer.
   3. UL listed or tested by independent testing laboratory, approved by State and Local Code jurisdictions.
   4. Use product that has a rating not less than rating of wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

5. Sleeves in concrete to be Schedule 40 steel pipe with integral water stop unless fire stop material used includes a sleeve that is an integral part of rated assembly.
6. Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

C. Non Rated Surfaces:
1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.
2. In exterior wall openings below grade, use modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe and cored opening or a water stop type wall sleeve.
3. At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effect seal. Use galvanized sheet metal sleeves in hollow wall penetrations.

2.4 EQUIPMENT, PIPING AND VALVE IDENTIFICATION

A. Equipment Labels:
1. After painting and covering, identify equipment, including pumps, tanks, compressors, and control panels. Locate identification conspicuously.
2. Identification of equipment shall be by engraved white letters on a black 1/16 inch thick plastic laminate panel, beveled edges, screw mounting, permanently attached to the equipment.
3. Minimum size:
   a. 3/4" x 2 1/2" with 3/8" letters.
4. Manufacturers:
   a. Setonply ® Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

B. Pipe Identification:
1. Pipe identification shall conform to ANSI A13.1 "Scheme for Identification of Piping Systems".
2. Printed labels identifying the fluid conveyed and direction of flow shall be attached to pipes in accessible locations, at intervals not to exceed 20 feet, not less than once in each room, at each branch, adjacent to each access door or panel, at each valve and where exposed piping passes through walls and floors.

Outside Diameter of Pipe Covering	**Minimum Size of Letters**
up to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1½"

3. Manufacturers:
   a. EMED Co., Seton Name Plate Company, or W. H. Brady.
4. Stencils:
   a. Not less than 1 inch high letters/numbers for marking pipe and equipment.

C. Valve Tags:
   1. Identify each valve by means of 1½" diameter brass tag fastened to body of valve with copper or brass chain. Identification number shall be stamped thereon with letters a minimum of ½" high. System identification abbreviation shall be stamped with letters a minimum of ¼" high.
   2. The following prefixes shall be used:
      a. PLBG - Plumbing
   3. Manufacturers:
      a. EMED Co., Seton Name Plate Company, or W. H. Brady.

D. Valve Charts:
   1. Furnish three charts listing each valve. Two charts shall be delivered to A/E. An additional chart shall be framed behind glass and hung in location selected by Owner. Charts shall show the following:
      a. Valve number Size
      b. Manufacturer Type of valve
      c. Type of service Location

E. Furnish a typewritten chart indicating equipment or areas served by each numbered valve and incorporate in Operating and Maintenance Manuals.

2.5 EQUIPMENT ACCESSORIES

A. Provide equipment accessories, connections, and incidental items.

B. Install piping connecting to pumps and other equipment without strain at the piping connection. If requested by the A/E, remove the bolts in these flanged connections, or disconnect piping, to demonstrate that piping has been properly connected.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordination of Work:
   1. Review the complete set of Drawings and Specifications and report discrepancies to the A/E. Obtain written instructions for changes necessary. Coordinate with each trade prior to beginning installation and make provisions to avoid interferences. Changes required caused by neglect to coordinate shall be made without expense to the project.
   2. Piping shall not be located above electrical panels.

B. Anchor Bolts, Sleeves, and Supports:
   1. These items required for the Work shall be furnished by the PC for proper installation of his work. They shall be installed (except as otherwise specified) by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them. Expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor for the trade with responsibility for directing their proper location.

C. Adjustments In Locations:
   1. Locations of pipes and equipment shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

D. Right Of Way:
   1. New lines which pitch shall have the right of way over those which do not pitch. For example: Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of conflicts.
   2. Offsets, transitions and changes in direction of electrical raceways, pipes, and ducts shall be made to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings.

3.2 OPENINGS, CUTTING AND PATCHING

A. Refer to Division 01 of the Project Manual.

B. Provisions for openings including chases, holes and clearances through walls, floors, and roof, ceilings and partitions shall be made in advance of construction of each part of the building. Openings shall be provided by the GC for the respective materials in which openings occur, during the construction of the building with the exception of pipe sleeves. The PC shall furnish to the GC opening dimensions and locations.

C. If the PC neglects to inform the GC of his opening requirements before that portion of the building construction is complete, the PC shall cut the openings and provide framing and lintels. In the event holes must be cut through reinforced concrete, avoid spalling and unnecessary damage or weakening of structural members. No chopping or breaking out is permitted. Before cutting or drilling, obtain permission from the A/E. Patch adjacent materials and repair damage resulting from the cutting.

3.3 BUILDING ACCESS

A. Arrange for necessary openings in building to allow for admittance of all apparatus. When building access was not previously arranged and must be provided by Contractor, restore opening to original condition after the apparatus has been brought into building. Coordinate with Architect/Engineer.

3.4 EQUIPMENT ACCESS

A. Install piping, conduit, fixtures, and accessories to permit access to equipment for maintenance. Coordinate exact location of wall and ceiling access panels and doors with General Contractor, making sure access is available for equipment and specialties. Where access is required in plaster walls or ceilings, furnish and install access doors required. Coordinate for installation of access doors utilizing General Contractor and other appropriate on-site subcontractor for access door installation.

3.5 Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color coded thumb tacks or screws, depending on surface, for use in accessible ceilings.

3.6 COORDINATION OF WORK

A. Install systems, equipment and piping in cooperation with other trades. Locations of pipes, equipment, fixtures, etc., shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication determine the exact route and location of each pipe (subject to A/E's approval).

B. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

C. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

D. Offsets, transitions and changes in direction of electrical raceways, pipes and ducts shall be made as required to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings. Furnish and install all traps, air vents, sanitary vents, etc., as required to effect the offsets, transitions and changes in direction.

E. New lines which pitch shall have the right of way over those which do not pitch. For example: Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed. Notify A/E and other trades of any conflicts.

F. Provide appropriate sections of work with required wall, roof and floor opening locations and dimensions. If Contractor neglects to coordinate information, openings shall be the responsibility of Contractor.

3.7 PIPING INSTALLATION

A. General:
   1. Expansion and contraction of piping shall be provided for by expansion loops, bends, swing joints, or expansion joints to prevent damage to connections, piping, equipment of the building.
   2. Unions or flanges shall be installed on all by-passes, ahead of all traps, adjacent to screw connection valves, and at all connections to equipment, whether or not shown on drawings.

B. Installation Arrangement:
   1. Install all Work to permit removal (without damage to other parts) of all parts requiring periodic replacement or maintenance. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

C. Connections Different From Those Shown:
   1. Where equipment requiring different arrangement or connections from those shown is used, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications. When requested by the A/E, submit drawings showing the proposed installation.
   2. If the proposed installation is approved, make all incidental changes in piping, ductwork, supports, insulation, wiring, panelboards, etc. Provide any additional motors, controllers, valves, fittings and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be responsible for the proper location of rough in and connections by other trades.
   3. All changes shall be made at no increase in the Contract amount or additional cost to the other trades.

3.8 SLEEVES

A. Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall.

B. Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.

C. In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 1 inch above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

3.9 PIPE PENETRATIONS

A. General:
   1. Coordinate location of building surface penetrations with appropriate contractors. Furnish sleeves, inserts, and devices to be built into structure to contractor performing Work. Prepare Shop Drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until Shop Drawings are approved.

B. Fire Rated Surfaces:
   1. Install products in accordance with the manufacturer's instructions where pipe penetrates a fire rated surface. When pipe is insulated, use product that maintains integrity of insulation and vapor barrier. Where sleeve must be installed in existing floor, grout area around sleeve to restore floor integrity. In wet area floor penetration, top surface of penetration to be 2 inches above adjacent floor with additional height obtained by means of concrete pad poured integral with floor.

C. Non Rated Surfaces:
   1. Install escutcheons or floor/ceiling plates where pipe penetrates non fire rated surfaces in occupied spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required when insulation completely covers wall opening and insulation end is trimmed in a neat manner. Occupied spaces for this Paragraph include only those rooms with finished ceilings and penetration occurs below ceiling.
   2. In exterior wall openings below grade, place water stop type wall sleeve before concrete pour or core drill opening after pour. Assemble rubber links to proper size for pipe and tighten in place in accordance with manufacturer's instructions.
   3. Install galvanized sheet metal sleeve in hollow wall penetrations to provide backing for sealant. Apply sealant to both sides of penetration in a manner that annular space between pipe sleeve and pipe or insulation is completely blocked.
   4. Completely seal (or caulk) around pipe penetrations through non-rated, smoke tight corridor walls in healthcare facilities. Refer to architectural drawings for additional information.

3.10 ESCUTCHEON PLATES

A. Provide plates on pipes passing through finished floors, walls and ceilings, with outside diameter to cover sleeve opening and inside diameter to fit snugly around pipe. Set tight to building surface. Escutcheon plates shall be chromium plated metal.

3.11 PAINTING

A. Refer to Division 09.

B. All exposed steel support structures (all metal surfaces located both inside and outside the building) shall be painted after installation with one coat of a compatible metal primer coat and two coats of a finish coat of paint for the application. Color shall be gray unless otherwise specified.

3.12 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.

B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

C. Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.

D. Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.

E. Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color-coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors. Included are the following topics:
   1. PART 1 – GENERAL
      a. Scope
      b. Related Work
      c. Reference Standards
      d. Quality Assurance
      e. Design Criteria
      f. Submittals
   2. PART 2 – PRODUCTS
      a. Manufacturers
      b. Pipe Hangers and Supports
      c. Pipe Hanger Rods
      d. Beam Clamps
      e. Riser Clamps
      f. Concrete Inserts
      g. Anchors
      h. Equipment Support
   3. PART 3 – EXECUTION
      a. Installation
      b. Structural Supports
      c. Hanger and Support Spacing
      d. Riser Clamps
      e. Concrete Inserts
      f. Anchors

1.2 RELATED WORK

A. Applicable provisions of Division 01 shall govern work under this section.

B. Section 22 05 00 – Common Work Results for Plumbing

C. Section 22 07 00 – Plumbing Insulation

D. Section 22 11 00 – Facility Water Distribution

E. Section 22 13 00 – Facility Sanitary Sewerage

F. Section 22 40 00 – Plumbing Fixtures

1.3 REFERENCE STANDARDS

A. MSS SP-58

B. MSS SP-69

1.4 QUALITY ASSURANCE

A. Refer to Division 01, of the Project Manual.

1.5 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

B. Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

C. Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.

D. General:
1. Secure pipe in place to prevent vibration, maintain proper slope and provide for expansion and contraction.
2. Design supports of strength and rigidity to suit loading, service, and manner which do not unduly stress the building construction. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing wherever practical. Do not use another pipe for support. Do not use perforated iron, chain or wire as hangers.
3. Use inserts for suspending hangers from reinforced concrete slabs wherever practical. Where inserts are not practical, provide channels or angles from which to suspend hangers/supports. Fasten structural steel to concrete with expansion bolts.
4. Provide expansion anchors in concrete slabs for installation of threaded support rods.
5. Provide hangers capable of vertical adjustment after piping is erected. Do not pierce ductwork with hanger rods. On threaded support rods and bolts, weld nuts to rods, peen threads, or provide double set of nuts with lock washers to prevent loosening. Use beam clamps for attaching hangers to structural steel.
6. On piping insulated with vapor barrier covering, use protection shield to cover bottom one half of insulated pipe. Shield to be a minimum of 12" long and of 16 gauge galvanized steel.

E. Exception:
1. For insulated drain pipe, the pipe may rest on the hanger and the insulation to wrap around the hanger and pipe.
2. Submit anchor drawings for approval upon request.

3. Hangers, supports, and support methods other than those specified shall not be used without obtaining approval on method of support by the Structural Engineer prior to installing piping systems. Submit support method arrangement, pipe weight and spacing scheme for approval.
4. Hanger and Support Spacing:
    a. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
    b. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.
    c. Use hangers with 1-1/2 inch minimum vertical adjustment.
    d. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
    e. Support riser piping independently of connected horizontal piping.
    f. Adjust hangers to obtain the slope specified in the piping section of these specifications.
    g. Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Horiz. Spacing	Max. Vert. Spacing
Cast Iron	2" and larger	5'-0"	15'-0"
Copper	1/2" through 3/4"	5'-0"	10'-0"
Copper	1" through 1-1/4"	6'-0"	10'-0"
Copper	1-1/2" through 2-1/2"	8'-0"	10'-0"
Copper	3"	10'-0"	10'-0"
Copper	4" and larger	12'-0"	10'-0"
Steel	1/2" through 1-1/4"	7'-0"	15'-0"
Steel	1-1/2" through 6"	10'-0"	15'-0"
Plastic	Drain and Vent	4'-0"	10'-0"
Plastic	1" or less	32"	4'-0"

1.6 SUBMITTALS

A. Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual.

B. Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.

C. Submit anchor drawings to the A/E for approval upon request.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. B-Line, Fee and Mason, Grinnell, Michigan Hanger, Pate, PHD Manufacturing, Piping Technology, Powers/Rawl, Proset, Roof Products & Systems, Unistrut, or Victaulic.

2.2 PIPE HANGERS AND SUPPORTS

A. Overhead Supports:
   1. Adjustable clevis hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3100.
   2. Adjustable J hook hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line figure B3690.
   3. Adjustable band hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3172.

B. Multiple or Trapeze Hangers:
   1. Where several pipes are running parallel and pitching in the same direction, strut style support may be used. Steel channel, 12-gauge thickness, Dura-Green epoxy coating or electro-plated, B-Line B11. Restrain individual pipes with B-Line B2000 series or Vibraclamp series strut clamps.

C. Wall Support:
   1. Carbon steel welded bracket with hanger. B-Line 3068 Series, Grinnell 194 Series.
   2. Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely anchored to wall structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Grinnell type PS 200 H with PS 1200 clamps.
   3. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Grinnell PS 1400 series.

D. Vertical Support:
   1. Riser clamp, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3373.
   2. Riser clamp, flexible sleeve with stainless steel band, Proset PS #33.

E. Floor Support:
   1. Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

F. Copper Pipe Supports:
   1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide isolation collar between supports/clamps/fasteners and copper piping.

2.3 PIPE HANGER RODS

A. Steel Hanger Rods:
   1. Steel, electro-plated, threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts. B-Line B3205.
   2. Size rods for individual hangers and trapeze support as indicated in the following schedule:
   3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8

2.4 BEAM CLAMPS

A. MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.

B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell 228.

2.5 CONCRETE INSERTS

A. Poured in Place:
1. MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Grinnell 281.
2. MSS SP-69 Type 18 universal type to be constructed of black malleable iron body with a removeable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N, Grinnell 282.

B. Drilled Fasteners:
1. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating, minimum tension load of 3200 pounds. Use drill bit of same manufacturer as anchor.
2. Manufactured By:
   a. Hilti, Powers/Rawl, Redhead.

2.6 ANCHORS

A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.7 EQUIPMENT SUPPORT

A. Examine Drawings, and manufacturer's data to determine how equipment, fixtures, and piping are to be supported, mounted or suspended. Support all equipment plumb, rigid, and true to line. Provide rods, bolts, inserts, pipe stands, brackets and accessories for proper support.

B. Equipment Stands:
1. Use structural steel members welded to and supported by pipe supports. Clean, prime and coat with three coat rust inhibiting alkyd paint or one coat epoxy mastic. Where exposed to weather, treat with corrosive atmosphere coatings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Size, apply and install supports and anchors in compliance with manufacturers recommendations.

B. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

C. Coordinate hanger and support installation to properly group piping of all trades.

D. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.

E. Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe insulation or directly on piping.

F. Perform welding in accordance with standards of the American Welding Society.

3.2 STRUCTURAL SUPPORTS

A. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

3.3 RISER CLAMPS

A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

3.4 CONCRETE INSERTS

A. Select size based on the manufacturer's stated load capacity and weight of material that will be supported. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch size. Where concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

3.5 ANCHORS

A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. This Section includes insulation specifications for plumbing systems. Included are the following requirements:
   1. PART 1 – GENERAL
      a. Scope
      b. Related Work
      c. Description
      d. Quality Assurance
      e. Definitions
      f. Submittals
   2. PART 2 – PRODUCTS
      a. Acceptable Manufacturers
      b. Insulation and Jackets
      c. Plenum Wrap
   3. PART 3 - EXECUTION
      a. General
      b. Installation
      c. Pipe Insulation Schedule

1.2 RELATED WORK

A. Requirements of Division 01 shall govern work under this Section.

B. Section 22 05 00 - Common Work Results for Plumbing

C. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

D. Section 22 11 00 - Facility Water Distribution Section

E. Section 22 13 00 - Facility Sanitary Sewerage

1.3 DESCRIPTION

A. Furnish and install insulating materials, fittings, finishes, and accessories specified for piping and related equipment. The following types of insulation are specified in this Section:
   1. Pipe insulation
   2. Equipment Insulation

3. Install insulation materials in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these Specifications, or where prior written approval has been obtained from Engineer.

1.4 QUALITY ASSURANCE

A. Label insulating products delivered to construction site with the manufacturer's name and description of materials.

1.5 DEFINITIONS

A. Concealed:
   1. Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. Other areas, including walk through tunnels, shall be considered as exposed.

B. Exposed to weather:
   1. Located outdoors, either on grade, on a wall, or on a roof, in location where sun, wind, rain, snow and other elements will come in contact with it.

C. Unconditioned spaces:
   1. Unheated or non-cooled attics, utility tunnels and crawl spaces were ambient temperatures may rise above 90°F, or drop below 50°F. Ducts in these instances are considered to be located outside of building thermal envelope.

1.6 SUBMITTALS

A. Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual

B. Include manufacturer's data for the following:
   1. Pipe insulation
   2. Equipment Insulation

C. Submittal shall include the following information:
   1. Manufacturer’s technical data sheets for each product with the following information:
      a. Density
      b. Thermal characteristics
      c. Temperature limitations
      d. Jacket type
      e. Materials of composition
      f. Material safety data sheets
   2. Schedule of all insulating materials to be used including:
      a. Application / intended use of each insulation type
      b. Insulation type and thickness
      c. Jacket type
      d. Fastening methods and adhesive type

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Armstrong, Halstead, Johns-Manville, Knauf, or Owens Corning.

2.2 INSULATION AND JACKETS

A. Glass Fiber:
   1. Manville Micro-Lok meeting ASTM C547; rigid molded, non-combustible, "K" Value: 0.23 at 75°F, maximum service temperature: 850°F, with vapor Retarder Jacket: AP-T Plus White Kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self-sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples or vapor barrier mastic as needed.

2.3 PVC Fitting Covers and Jackets:

1. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be .02 inch (20 mil).

2.4 PLENUM WRAP

A. Manufacturers: 3M Fire Barrier Wrap 5A+, or equal.

B. Install plenum wrap on non-plenum rated piping located in plenum ceiling spaces.

C. Non-asbestos inorganic fiber blanket encapsulated with a scrim-reinforcement foil, 6 PCF density, UL 910 (NFPA 262), UL 1887, and ASTM E84 listed.

PART 3 - EXECUTION

3.1 GENERAL

A. Application of insulation to piping equipment shall be done in accordance with the manufacturer's installation recommendations. Where thickness of insulation is not specified, use thickness recommended by manufacturer or required by applicable Codes.

B. Insulation shall be applied in as warm an environment as possible, and in no instance below 25°F.

C. No pipe shall be covered until after it has been installed, inspected, tested and approved.

3.2 INSTALLATION

A. All pipe insulation shall be installed with joints butted firmly together. All valves and fittings shall be insulated with mitered sections of insulation equal in density and thickness to the adjoining insulation, or with insulating cement equal in thickness to the adjoining insulation, or with "Zeston" type, premolded PVC fittings installed in accordance with the manufacturer's instructions. Fittings are to be finished with 8 oz. glass mesh and mastic (use breather mastic on systems operating above 50°F except where Zeston PVC covers are used). Jackets on pipe insulation may be stapled using outward clinch staples spaced 3" apart at least ¼" in from the lap edge on systems operating at 60°F and above; below 50°F the laps are to be vapor sealed using self-sealing lap, lap seal tape gun or adhesive such as Armstrong 520. All insulation ends are to be tapered and sealed regardless of service.

B. On all piping insulated with vapor barrier covering, use protection shield to over bottom one half of insulated pipe. Shield to be minimum of 12" long and 16 gauge galvanized steel. Provide half round, 12" long, hanger block at the bottom half of the pipe in place of the fiberglass pipe insulation. The hanger blocks shall be molded cork or calcium silicate pipe insulation of the same thickness as the adjoining fiberglass pipe insulation. The vapor barrier jacket shall be continuous through the hanger location.

C. Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Pipe hangers shall be sized large enough to be installed over the outer surfaces of the insulation.

D. Exception:
   1. For insulated drain pipe, the pipe may rest directly on the hanger and the insulation to wrap around the hanger and pipe.

E. Omit insulation for:
   1. Unions and flanges.
   2. Vents to atmosphere, discharges from safety and relief valves and drain pipes.

F. Provide finished edges at all access doors and end.

G. Protective Jackets:
   1. Provide a protective PVC jacket for the following insulated piping:
      a. Piping located in unconditioned toilet rooms.
      b. Kitchens.
      c. Garages.
      d. Food Handling Rooms.

H. Lap seams and joints a minimum of 2 inches and continuously seal with welding solvent recommended by jacket manufacturer. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction. For sections where vapor barrier is not required and jacket requires routine removal, tack fasteners may be used.

I. Provide a protective metal jacket for the following insulated piping:
   1. Solar hot water piping on roof.

J. Lap seams a minimum of 2 inches. Secure with metal bands for end to end joints, and rivets or sheet metal screws for longitudinal joints. Rivets, screws, and bands to be constructed of the same material as the jacket. Locate seams on bottom for exterior applications.

3.3 PIPE INSULATION SCHEDULE

A. Provide insulation on new and remodeled piping.

B. Minimum Insulation Thickness:

	PIPE SIZE			
SYSTEMS	1-1/4" or less	1-1/2" to 2"	2-1/2" to 4"	5" and up
Storm Drain*	---	---	1"	1"
Clearwater Waste*	---	1"	1"	1"
Domestic Cold Water	1/2"	1/2"	1"	1"
Domestic Hot Water	1"	1-1/2"	1-1/2"	1-1/2"
Domestic Hot Water Return	1"	1-1/2"	1-1/2"	---
Tempered Water	1/2"	1"	1"	---

* Provide pipe insulation on above ground horizontal storm and clearwater drain piping, underside of roof drain, and initial 5 feet of vertical conductors.

END OF SECTION

SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:
   1. PART 1 – GENERAL
      a. Scope
      b. Related Work
      c. Description
      d. Quality Assurance
      e. Submittals
   2. PART 2 – PRODUCTS
      a. Water Distribution Pipe and Fittings
      b. Valves
      c. Unions and Flanges
      d. Dielectric Couplings
      e. Water Hammer Suppressors
   3. PART 3 – EXECUTION
      a. Water Piping System
      b. Testing

1.2 RELATED WORK

A. Requirements of Division 01 shall govern work under this Section.

B. 22 05 00 – Common Work Results for Plumbing

C. 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

1.3 DESCRIPTION

A. Provide a domestic water distribution system including hot and cold water supply piping, hot water return piping, tempered water piping, pure water piping, valves, fittings, hardware, and specialties. Connect to plumbing fixtures, specialties, and equipment.

B. Work under this section shall commence 5’-0” outside the building structure with a connection to the combination water supply lateral provided by the site utility contractor.

1.4 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

B. Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

C. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

D. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

1.5 SUBMITTALS

A. Submit valve product data sheets in accordance with Section 22 05 00 and Division 01 of the Project Manual.

B. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, and identification as referenced in this section and/or on the drawings.

PART 2 - PRODUCTS

2.1 WATER DISTRIBUTION PIPE AND FITTINGS

A. Above Ground:
1. Copper tube, Type L, hard temper, ASTM B88; with wrought copper fittings, ANSI B16.22. Join using lead free flux, ASTM B813, and solder, ASTM B32.

2.2 VALVES

A. Manufacturer:
1. Valves throughout the project shall be by one manufactur¬er, unless otherwise specified.
2. Standard valves are based on Nibco models. Equivalent style valves as manufactured by Apollo, Crane, DeZurik, Gustin-Bacon, Grinnell, Hammond, Jenkins, Lunkenheimer, Milwaukee Valve, Stockham, Victaulic, or Watts are acceptable. Valves shall be of standard dimensions, comparable to the number specified.
3. Balancing valves are based on Bell & Gossett models. Equivalent style valves by Armstrong, Flowset, Nibco, Taco, or Victaulic/TA Hydronics are acceptable.

B. Shutoff Valves:
1. Except as otherwise specified, all shutoff valves 2-1/2 inch and smaller shall be ball valves and shutoff valves 3 inch and larger shall be butterfly valves, unless required otherwise by local Water Utility specifications.

C. Ball Valves:
1. Bronze, two piece full port ball valves with bronze body, solder or threaded ends, chromium plated brass ball, reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-585-70. Include handle extension for insulated piping, NIB-SEAL by Nibco.

2. Bronze, two piece full port ball valves with bronze body, solder or threaded ends, stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-585-70-66. Include handle extension for insulated piping, NIB-SEAL by Nibco.
3. Bronze, three piece full port ball valves with bronze body, solder or threaded ends, stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-595-66. Include handle extension for insulated piping, NIB-SEAL by Nibco.

D. Butterfly Valves:
1. Ductile iron butterfly valve, polymid coated, EPDM elastomer coated disc, extended neck, grooved ends, 300 psi WOG pressure rated, Nibco GD 4765. Include lever handle through 6-inch size and gear operator for 8 inch and larger size.
2. Cast bronze butterfly valve, EPDM elastomer coated ductile iron disc, copper tube dimensioned grooved ends, 300 psi maximum pressure rated, Victaulic Series 608. Include lever handle through 6-inch size.

E. Check Valves:
1. 3" and Smaller:
2. Bronze body, Class 125, Y-pattern, swing type, check valve with solder ends, all bronze internal components and renewable seat and disc, Nibco model S-413-B.

F. 4" and Larger:
1. Cast iron body, Class 125, horizontal swing type, check valve with flanged ends, bronze trim and renewable seat and disc, Nibco model F-918-B.

G. 2" and Smaller:
1. Bronze body, ASTM B62, in-line lift type, spring, Buna-N disc, 250 psig WOG rating. Nibco 480

H. 2-1/2" and Larger
1. Iron body, bronze seat with Buna-N, bronze disc, in-line lift type, spring, 250 psig WOG rating, Nibco W960

I. Balancing Valves:
1. ½" thru 2":
2. Bronze body balancing valve with sweat or threaded ends, calibrated brass orifice, integral adjustment knob with calibrated scale, memory stop indicator, drain tapping and differential pressure metering connections, Bell & Gossett "Circuit Setter".
3. Ametal® brass copper alloy, y-pattern, globe type balancing valve with soldered or threaded ends, EPDM o-ring seals, 4-turn digital readout hand wheel with locking, tamper-proof setting, and differential pressure metering connections, separate shutoff valve not required, 300 psi at 250 deg F. Victaulic/Tour & Andersson Series 786, 787 & 78K balancing valves with Victaulic Series 799 or 79V Koil-Kit™ coil pack consisting of Victaulic Series 78U union port fitting, Series 78Y strainer/ball valve or Series 78T union/ball valve combination, and flexible hoses to complete terminal hookup at coil outlet.

J. Gauge Valves:
1. ¼" Size:
2. Bronze body, rising stem gauge/globe valve with renewable seat and disc and malleable iron hand-wheel, Nibco T 235. Valve shall be rated for 300 PSI non-shock WOG.

K. UNIONS AND FLANGES
1. Unions:
a. Bronze, solder connection, Nibco figure 733.
2. Flanges:
a. Cast copper alloy, class 125, MSS SP-106, Nibco figure 741.

2.3 DIELECTRIC COUPLINGS

A. Steel casing, zinc electroplated, with inert thermoplastic lining, various end types, Clearflow, style 47 by Victaulic.

B. Dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets and pressure rating of not less than 175 psig at 180 degrees Fahrenheit. Watts Regulator Company, Lochinvar, Wilkins, Epco Sales, Inc.

2.4 WATER HAMMER SUPPRESSORS

A. Acceptable manufacturers are MIFAB, PPP, Sioux Chief, and Watts.

B. Piston compressed air column type, with sealed air chamber.

C. Water supply piping serving fixtures, appliances, equipment and devices with quick closing and/or solenoid-actuated valves shall be provided with water hammer arrestors. Also provide where indicated on the water supply piping as shown on the water supply isometrics. Devices shall be mechanical arrestors installed in accordance with PDI Standard WH201. Air chambers are not considered to be equal.

D. Shop drawings are required. Submit to A/E for approval prior to installation.

E. Water hammer arrestors must be accessible for inspection and replacement. Provide access panel.

PART 3 - EXECUTION

3.1 WATER PIPING SYSTEM

A. Piping shall be pitched to drain entire system; install drain valves at low points. Provide unions at equipment and valves. Provide offsets and transition fittings as required. Avoid dips or depressions in pipe runs.

B. No water piping shall be installed in exterior walls, unless adequately protected from freezing. Two inch insulation shall be installed on back and sides of chase, front shall be open to room heat, covered only by finished wall material.

C. Install unions, couplings, or flanges at all final equipment connections and as required to facilitate removal of equipment.

D. Install dielectric couplings at every connection between copper pipe and other metals. Use dielectric unions for connecting copper and steel piping.

E. Provide backflow devices as required by Code on water connections to HVAC equipment and other equipment.

F. Extend hot water piping from water heater and connect to all fixtures and equipment as required.

G. Hot water and cold water lines shall be kept at least 6 inches apart whenever possible.

H. Hot Water Re-Circulating System:
   1. Install return system including check valves, balancing valves, and pumps. Pitch and grade all lines as required to ensure satisfactory circulation.
   2. Adjust each balancing valve and set position stop. Balance system to minimum flow in return piping branches needed to maintain even supply water temperature and to provide continuous circulation throughout building. Provide balancing report along with O&M manual submittals. Test and demonstrate to A/E upon request.

I. Valve Installation:
   1. Install shutoff valves with stem vertical. Exception; the stem may be horizontal if a vertical installation would not allow access to the valve handle
   2. All valves with screwed ends shall be installed using "Teflon" tape applied on male portion of piping fitting.
   3. Each individual fixture or piece of equipment shall have an independent shut off valve adjacent to fixture in addition to the required branch shut off. Where valves are installed in walls an access panel shall be provided.

J. Branches:
   1. Valve shut off full size of branch for each branch take off to supply stack or fixture group.

K. Drains:
   1. Provide valved drains at low points of systems as required or directed. All piping shall be arranged to drain through valved drains.

L. Flushing Mains and Branch Piping:
   1. Upon completion of the water distribution system, test all valves to insure their full opening and flush out the system progressively by opening drain valves and building outlets and permitting the flow to continue from each until the water runs clear.

M. Pipe Insulation:
   1. Provide pipe insulation for all domestic water piping per Section 22 07 00.

N. Sterilization of Water Distribution System:
   1. As soon as the water distribution system has been flushed out as above specified, it shall be sterilized in accordance with the requirements of the local Health Department/Water Utility or in the absence of such, by the following method:
      a. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling the lines slowly and applying the sterilizing agent at a rate of 50 parts per million of chlorine, as determined by residual chlorine tests at the ends of the lines. Open and close all valves and hydrants while the system is being chlorinated.

b. After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the lines. If less than 5 PPM as indicated, repeat the sterilization process.
c. When tests show at least 5 PPM of residual chlorine flush out the system until all traces of the chemical used are removed.

O. Samples
1. After disinfecting the water distribution system, take water samples to check for bacteria. Take 5 water samples from remote faucets, plus the main entrance. Send the samples to the Wisconsin Department of Health Lab to sample for a safe water supply system.

3.2 TESTING

A. Refer to Division 01, "Starting of Systems" and Section 22 05 00.

B. Hydro-statically pressure test water piping to 150 psig for 4 hours. No decrease in pressure is allowed. Provide pressure gauge with shutoff and a bleeder valve at the highest point of the system tested. Inspect joints in system under test. No leaks allowed.

C. Systems with a combination water supply fire protection service shall have the service portion of the system tested per NFPA 24.

D. Do not conceal pipe until satisfactorily tested.

E. Testing with air will not be allowed.

END OF SECTION

SECTION 22 13 00

FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for plumbing pipe and pipe fittings for this project. Included are the following topics:
   1. PART 1 – GENERAL
      a. Scope
      b. Related Work
      c. Description
      d. Quality Assurance
      e. Submittals
   2. PART 2 – PRODUCTS
      a. Above Ground Pipe and Fittings
      b. Drains and Cleanouts
   3. PART 3 - EXECUTION
      a. Drain and Vent Piping System
      b. Pipe Joints
      c. Plenum Ceiling Spaces
      d. Safings
      e. Cleanouts
      f. Traps
      g. Testing

1.2 RELATED WORK

A. Requirements of Division 01 shall govern work under this Section.

B. 22 05 00 – Common Work Results for Plumbing

C. 22 05 14 – Plumbing Specialties

D. 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

1.3 DESCRIPTION

A. Interior sanitary waste and vent and acid drain and vent piping systems including branches, drains, cleanouts, stacks, fittings and hardware.

B. Work under this section shall commence from 5 feet outside the building wall with connections to sanitary building sewer lateral(s).

1.4 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Section 22 05 00 and Division 01 of the Project Manual.

B. Order all pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

C. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.5 SUBMITTALS

A. Submit data in accordance with Section 22 05 00 and Division 01 of the Project Manual.

B. Schedule from the contractor indicating the ASTM, or CISPI specification number of the pipe being proposed along with its type and grade, and sufficient information to indicate the type and rating of fittings for each service.

C. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, and identification as referenced in this section and/or on the drawings.

PART 2 - PRODUCTS

2.1 ABOVE GROUND PIPE AND FITTINGS

A. Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket couplings, ASTM C564, and stainless steel clamp, CISPI 310. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer. Piping and fittings shall be manufactured by AB&I, Charlotte, or Tyler.

B. PVC, Schedule 40, Type I, ASTM D 1785, and PVC drain-waste-vent fittings, ASTM D 2665, with solvent weld joints, ASTM D2855. Solid wall PVC only.

2.2 DRAINS AND CLEANOUTS

A. Drains and cleanouts manufactured by J.R. Smith, Josam, MIFAB, Sioux Chief, Wade, Watts, or Zurn.

B. Refer to Plumbing Drain and Cleanout Schedule.

PART 3 - EXECUTION

3.1 DRAIN AND VENT PIPING SYSTEM

A. Connect all drain and vent piping to each fixture and piece of equipment and install all required piping as shown on drawings. Provide all necessary fittings and hardware to make required offsets and transitions.

B. Changes in direction of drainage piping shall be made by the appropriate use of 45 degree wyes, long or short sweep 1/4 bends, 1/6, 1/8, 1/16 bends or combination.

C. Fittings to be installed to make for the least possibility of stoppage. All horizontal drainage piping less than 3 inches shall be pitched a minimum of 1/4 inch per foot of run. Pitch drainage piping 3 inch and larger a minimum of 1/8" per foot of run.

D. Connect to all drains, fixtures and equipment as required.

3.2 PIPE JOINTS

A. Install cast iron pipe and fittings, hubless pattern, as recommended by CISPI standards 301, 310, and in their publication "Installation Suggestions for Cast Iron No Hub Pipe and Fittings".

B. Prepare PVC pipe ends as recommended by manufacturer. Use a P 70 type primer (for PVC) and a PVC solvent cement appropriate to the pipe size and temperature range.

3.3 PLENUM CEILING SPACES

A. PVC piping shall not be installed in spaces used as air plenums. Review HVAC drawings and specifications to determine exact locations of areas used as air plenums.

3.4 CLEANOUTS

A. Provide and install cleanouts as shown on plans and as required by Code.

3.5 TRAPS

A. Trap all fixtures and equipment. Trap seals shall be standard depth, except when deep seals are required by Code. Traps shall be set true and level and located within the limits of the Code requirements. A trap shall not be used as a separator, interceptor or other type of device to retain solids. All traps above grade shall be provided with approved screw type cleanout plugs.

B. Traps shall be protected during construction and sealed to prevent foreign matter from entering. Provide adjustable expansion plug, plastic cap, or approved equivalent.

3.6 TESTING

A. Refer to Testing paragraph of Section 22 05 00.

B. Hydro-statically pressure test all piping to 10 feet of water column pressure for 2 hours. No leaks allowed. Provide mint test of entire system as required by local inspector.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for plumbing fixtures, faucets and trim for this project. Included are the following topics:
   1. PART 1 – GENERAL
      a. Scope
      b. Related Work
      c. Description
      d. Reference Standards
      e. Quality Assurance
      f. Submittals
   2. PART 2 – PRODUCTS
      a. General
      b. Manufacturers
   3. PART 3 - EXECUTION
      a. Installation

1.2 RELATED WORK

A. Requirements of Division 01 shall govern work under this Section.

B. Section 22 05 00 – Common Work Results for Plumbing

C. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

D. Section 22 11 00 – Facility Water Distribution Section 22 13 00 - Facility Sanitary Sewerage

1.3 DESCRIPTION

A. Furnish and install plumbing fixtures with traps, drains, stops, faucets, flush valves, carriers and hardware.

1.4 REFERENCE STANDARDS

A. ANSI A112.6.1M-88 Supports for Off-the Floor Plumbing Fixtures for Public Use.

B. ANSI A112.18.1-94 Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI A112.19.2M-82 Vitreous China Plumbing Fixtures.

D. ASSE 1011-93 Hose Connection Vacuum Breakers.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to 22 05 00 and Division 01 of the Project Manual.

B. Plumbing products requiring approval by the State of Wisconsin Dept. of Commerce must be approved or have pending approval at the time of shop drawing submission.

1.6 SUBMITTALS

A. Submit product data sheets in accordance with Division 01 and Section 22 05 00.

B. Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of construction, ratings, weights, trim, finishes, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fixtures must conform to general requirements given below and to specified requirements for each type.

B. Vitreous china fixtures shall conform to ANSI A112.19.2M.

C. Stainless steel fixtures shall conform to ANSI A112.19.3.

D. Fixtures shall be installed so that parts are accessible for repairs when fixtures are in place. Manufacturer's trademark or name shall be visible on fixtures.

E. Faucets, traps, exposed fittings and trim shall be polished chrome plated unless otherwise specified. Provide polished chrome plated nipples at all lavatories.

F. Exposed piping penetrating walls, floors or ceilings shall have chrome plated escutcheons, or flanges of sufficient depth to seal the opening.

G. Fixture stops shall be heavy duty commercial grade, slow compression angle valves with 1/2" inlet and 3/8" or 1/2" chrome plated flexible riser.

H. Traps shall be semi-cast 17-gauge brass, chrome plated, with cleanout and escutcheon. Sink traps shall be 1-1/2" minimum.

2.2 MANUFACTURERS

A. Carriers for wall-mounted fixtures shall be manufactured by J.R. Smith, Josam, MIFAB, Wade, Watts, or Zurn.

B. Cast terrazzo and molded stone products shall be manufactured by Crane/Fiat, Mustee, or Stern-Williams.

C. Stainless steel sinks shall be manufactured by Advance-Tabco, Elkay, or Just.

D. Manual faucets shall be manufactured by American Standard, Chicago Faucet, Kohler, Moen Commercial, Speakman, Symmons, T&S Brass, Sloan (Polaris), or Zurn.

E. Electronic sensor operated faucets shall be manufactured by Bradley, Chicago Faucet, Kohler, Sloan, Speakman, or Zurn.

F. Heavy duty stops and supplies shall be manufactured by Chicago Faucet, Dearborn, EBC, Kohler, McGuire, T&S Brass, or Zurn.

G. Traps shall be semi-cast 17 gauge brass, chrome plated, with cleanout and escutcheon as manufactured by Dearborn, EBC, Keeney, Kohler, McGuire, or Zurn.

H. Supply, drain and trap insulating kits shall be manufactured by Brocar, EBC, McGuire, Plumberex, or Truebro.

I. Fixtures:
   1. See Plumbing Fixture Schedule on drawings for type, manufacturer, and model for fixtures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing fixtures in accordance with manufacturer's instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.

B. Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing. Individual supplies to fixtures shall be provided with support to prevent movement.

C. Install barrier free fixtures in compliance with COMM 52, 69 and Federal ADA Accessibility Guidelines. Install barrier free lavatory traps parallel and adjacent to wall and supplies and stops elevated to avoid contact by wheelchair users.

D. Seal joints between countertop, wall, floor and fixtures with G.E. Silicone caulk; white, clear or color to match fixture with colored caulk by fixture manufacturer.

E. Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.

F. Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, same items in concealed locations may be of rough brass finish.

G. Set floor mounted water closets, floor mounted service sinks; counter mounted lavs and sinks; lav and sink faucets and drains with full setting bed of flexible non-staining plumber's putty. Cover exposed water closet bolts with bolt covers.

H. After installation, fixtures shall be protected to prevent scratching or other damage during construction.

I. Prior to acceptance, fixtures shall be cleaned with compounds recommended by the respective manufacturer.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SCOPE

A. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Quality Assurance
      f. Continuity of Existing Services
      g. Protection of Finished Surfaces
      h. Sleeves and Openings
      i. Sealing and Fire Stopping
      j. Equipment Furnished By Others
      k. Provisions for Future
      l. Submittals
      m. Off Site Storage
      n. Permits, Certificates and Inspections
      o. Operating and Maintenance Data
      p. Training of Owner Personnel
      q. Record Drawings
      r. Cleaning
      s. Warranty
   2. Part 2 – Products
      a. Access Panels and Doors
      b. Identification
      c. Sealing and Fire Stopping
   3. Part 3 – Execution
      a. Demolition
      b. Cutting and Patching
      c. Building Access
      d. Equipment Access
      e. Coordination
      f. Identification
      g. Lubrication
      h. Sleeves and Openings
      i. Sealing and Fire Stopping

1.2 RELATED WORK

A. Section 07 84 00 - Fire Stopping

B. Section 23 05 13 - Common Motor Requirements for HVAC.

C. Section 23 33 00 - Air Duct Accessories.

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in other sections are as follows:

1.	AABC	Associated Air Balance Council
2.	ADC	Air Diffusion Council
3.	AGA	American Gas Association
4.	AMCA	Air Movement and Control Association
5.	ANSI	American National Standards Institute
6.	ARI	Air-Conditioning and Refrigeration Institute
7.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
8.	ASME	American Society of Mechanical Engineers
9.	ASTM	American Society for Testing and Materials
10.	AWS	American Welding Society
11.	CGA	Compressed Gas Association
12.	EPA	Environmental Protection Agency
13.	IEEE	Institute of Electrical and Electronics Engineers
14.	ISA	Instrument Society of America
15.	MCA	Mechanical Contractors Association
16.	MICA	Midwest Insulation Contractors Association
17.	MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
18.	NBS	National Bureau of Standards
19.	NEBB	National Environmental Balancing Bureau
20.	NEC	National Electric Code
21.	NEMA	National Electrical Manufacturers Association
22.	NFPA	National Fire Protection Association
23.	SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
24.	UL	Underwriters Laboratories Inc.
25.	ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
26.	ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
27.	UL1479	Fire Tests of Through-Penetration Firestops
28.	UL723	Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

A. Refer to Division 1, General Conditions, Equals and Substitutions.

B. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories

into the system and for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

1.6 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the owner, or facilities maintenance. When interruption is required, coordinate the down-time with the user agency to minimize disruption to their activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

1.7 PROTECTION OF FINISHED SURFACES

A. Refer to Division 1, General Requirements, Protection of Finished Surfaces.

B. Furnish one can of touch-up paint for each different color factory finish which is to be the final finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.8 SLEEVES AND OPENINGS

A. Refer to Division 1, General Requirements, Sleeves and Openings.

1.9 SEALING AND FIRE STOPPING

A. Sealing and fire stopping of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

1.10 EQUIPMENT FURNISHED BY OTHERS

A. None.

1.11 PROVISIONS FOR FUTURE

A. Portions of the fourth floor hot water piping are designed for future expansion.

1.12 SUBMITTALS

A. Refer to Division 1, General Conditions, Submittals.

B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents.

C. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the architect/engineer that the equipment submitted and the motor starter schedules are in agreement or indicate any

discrepancies. See related comments in Section 23 05 13 in Part 1 under Electrical Coordination.

D. Include wiring diagrams of electrically powered equipment.

E. Submit electronic (PDF) copy of all submittals for review by A/E, Architect, Owner, Owners Representative and Building Operator.

F. OFF SITE STORAGE
   1. Any required offset storage of material is the responsibility of the contractor. Materials or equipment damaged while stored offsite, or while transported to or from offset storage will not be allowed to be installed.

G. PERMITS, CERTIFICATES AND INSPECTIONS
   1. Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.
   2. Obtain and pay for all required local and State construction permits.
   3. Obtain and pay for all required local, State and Federal installation inspections except those provided by the Architect/Engineer in accordance with code. Deliver originals of these certificates to the Project Representative. Include copies of the certificates in the Operating and Maintenance Instructions.

H. OPERATION AND MAINTENANCE DATA
   1. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.
   2. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:
      a. Records of tests performed a to certify compliance with system requirements
      b. Certificates of inspection by regulatory agencies
      c. Valve schedules
      d. Lubrication instructions, including list/frequency of lubrication
      e. Copies of all approved shop drawings.
      f. Manufacturer's wiring diagrams for electrically powered equipment
      g. Temperature control record drawings and control sequences
      h. Parts lists for manufactured equipment
      i. Warranties
      j. Additional information as indicated in the technical specification sections
   3. Provide three (3) hardcopies of the Operation and Maintenance Manual. Manuals shall be organized in three ring binders with dividers and reference tabs. Manuals shall be delivered as follows:
      a. Two copies to the Building Engineer (to be kept on site).
      b. One copy to the Owners Representative (to be kept at Public Works).
   4. Provide three (3) electronic (Adobe PDF) copies of the Operation and Maintenance Manual.
      a. Provide each copy on a separate portable USB flash drive.
      b. Deliver each portable USB drive with hardcopy manuals to parties listed above.

I. TRAINING OF OWNER PERSONNEL
   1. Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video tape all training sessions. Include not less than 4 hours of instruction, using the Operating and Maintenance manuals during this

instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.

2. Provide (3) electronic copies (on flash drive) of training video to be delivered as follows:
   a. One copy to the Building Engineer.
   b. One copy to the Tenant (to be kept on site).
   c. One copy to the Owners Representative.

J. RECORD DRAWINGS
1. Refer to Division 1, General Requirements, Record Drawings.
2. Maintain accurate as-built or record drawings throughout the duration of the project. As-built drawings shall be available on site at all times for review by the A/E or owner.
3. If, during project closeout, the A/E or owner observes installations that are not accurately recorded on the as-built or record drawings, the record drawings will not be accepted and the contractor will be required, at their own expense, to provide updated and accurate record drawings.
4. In addition to the data indicated in the General Requirements, maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

K. CLEANING
1. Keep the premises broom clean and free of surplus materials, rubbish and debris.
2. Clean all equipment, piping, duct, strainers, filters, etc. prior to building turnover to owner. All systems shall be turned over to owner in condition ready for operation.

L. WARRANTY
1. Warrant that work shall function for one year immediately following the acceptance of the system(s). The date of acceptance shall be an agreed upon date by all parties, including Division 23 contractor, General Contractor, Owner, Tenant and A/E.
2. Keep the system in good working order at no expense, unless defects are clearly the result of improper usage.
3. Warranty calls shall be at no cost to the owner.
4. Submit for acceptance of the work, written certification that the entire system has been installed and adjusted for operation in accordance with the Contract Documents.

PART 2 PRODUCTS

2.1 ACCESS PANELS AND DOORS

A. LAY-IN CEILINGS:
1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under Section 09500 are sufficient; no additional access provisions are required unless specifically indicated.

B. Plaster Walls and Ceilings:
1. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; minimum size is 12" by 12".

2.2 IDENTIFICATION

A. STENCILS
1. Not less than 1 inch high letters/numbers for marking pipe and equipment.

B. SNAP-ON PIPE MARKERS
1. Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without the use of adhesive, tape or straps. Not less than 1 inch high letters/numbers and flow direction arrows for piping marking. W. H. Brady, Seton, Marking Services, or equal.

C. ENGRAVED NAME PLATES
1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by EMED Co., or equal by Marking Services, or W. H. Brady.

D. VALVE TAGS
1. Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company, Marking Services, or W. H. Brady.

2.3 SEALING AND FIRE STOPPING

A. FIRE AND/OR SMOKE RATED PENETRATIONS
1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 “Fire Stopping”.

B. NON-RATED PENETRATIONS

1. Pipe Penetrations
a. At pipe penetrations of non-rated interior walls, floors and exterior walls above grade, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood walls where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material.
2. Duct Penetrations
a. Concealed Locations:
1) Pack annular space with fiberglass batt insulation or mineral wool insulation. Provide 4" sheet metal escutcheon around duct on both sides of partition or floor to cover annular space.
b. Exposed Locations
1) Where a duct is exposed with no ceiling, the opening shall be patched to match the existing construction tight to the duct or duct insulation.

PART 3 EXECUTION

3.1 DEMOLITION

A. Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where

pipe or duct is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the user agency to minimize disruption to the existing building occupants.

B. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the user agency. All designated equipment is to be turned over to the user agency for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

3.2 CUTTING AND PATCHING

A. Refer to Division 1, General Requirements, Cutting and Patching.

B. Any cutting and patching not specifically indicated to be provided by others shall be performed by the Division 23 contractor.

3.3 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.4 EQUIPMENT ACCESS

A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Mechanical Contractor and installed by the General Contractor.

B. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels. Thumb tacks shall identify locations of air terminals, control valves and shut-off valves.

3.5 COORDINATION

A. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or cooling terminal units installed in/on architectural surfaces.

B. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

C. Cooperate with the test and balance agency in ensuring Section 23 05 93 specification compliance. Verify system completion to the test and balance agency (flushing, pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of

hydronic systems, clean filters, clean strainers, duct and pipe systems cleaned, controls adjusted and calibrated, controls cycled through their sequences, etc.), ready for testing, adjusting and balancing work. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls, etc., required for functional and balanced systems. Demonstrate the starting, interlocking and control features of each system so the test and balance agency can perform its work.

3.6 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment such as cabinet heaters and ceiling fans in occupied spaces.

B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

C. Identify piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where exposed piping passes through walls, floors or roofs. Pipe shall be labeled with
   1. Pipe content (HWS, HWR, CWS, CWR, etc.).
   2. Pipe flow direction.
   3. Pipe size.

D. Use one coat of black enamel against a light background or white enamel against a dark background for stenciling, or provide snap-on pipe markers as specified in Part 2 – Products.

E. Identify valves with brass tags bearing a system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device or located in another room not visible from the terminal unit. Provide a typewritten valve schedule indicating the valve number and the equipment or areas supplied by each valve; locate schedules in each mechanical room and in each Operating and Maintenance manual. Schedules in mechanical rooms to be framed under clear plastic.

F. Use engraved name plates to identify control equipment.

G. Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork directly adjacent to access doors using a minimum of 0.5 inch height lettering reading, “SMOKE DAMPER” or “FIRE DAMPER”. Smoke and combination fire smoke dampers shall also include a second line listing the individual damper tag. The tags must be coordinated with the mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification are unacceptable. All labels shall be clearly visible from the ceiling access point.

3.7 LUBRICATION

A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.8 SLEEVES AND OPENINGS

A. Pipe penetrations in existing concrete floors: Core drill openings.

B. Pipe penetrations through existing floors located in food service areas that do not require a T rating: Core drill sleeve opening large enough to insert schedule 40 sleeve, extend sleeve 2 inches above the floor and grout area around sleeve with hydraulic setting, non-shrink grout. Size sleeve to allow insulated pipe to run through sleeve and paint the sleeve.

C. Where penetrating pipe or conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.

3.9 DUCT SLEEVES:

A. Duct sleeves are not required in non-rated partitions or floors.

B. Provide sleeve required for fire dampers in fire-rated partitions and floors. Reference fire damper details on drawings.

3.10 SEALING AND FIRE STOPPING

A. FIRE AND/OR SMOKE RATED PENETRATIONS
   1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

B. NON-RATED PENETRATIONS:
   1. Pipe Penetrations – Interior and Exterior Walls Above Grade
      a. Pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.
      b. At interior penetrations, finish should match the adjacent partition finish.
   2. Duct Penetrations – Concealed Above Ceiling
      a. Install sheet metal escutcheons with fiberglass or mineral wool insulation fill.
   3. Duct Penetrations – Exposed – No Ceiling
      a. Patch opening to match the adjacent partition construction tight to the duct or duct insulation.

C. NEW PENETRATIONS SUBJECT TO WATER INTRUSION:
   1. For new penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:
      a. Pipe penetration where steel pipe sleeve is used extend steel sleeve 2” above the floor.
      b. Pipe penetration where cast in place fire stopping device/sleeve is used, extend device/sleeve 2” above the floor (provided it meets the device’s UL listing).
      c. Pipe penetration where there is no steel sleeve or cast in place fire stopping device/sleeve, provide 2”x 2” x 1/8” galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8”on center. Seal corners water tight with urethane caulk.
      d. Floors subject to water intrusion or rooms housing electrical equipment include the following locations:
         1) Mechanical/Plumbing Equipment Rooms

e. Provide waterproof caulk sealant top coating on fire stopping system (or other approved means to protect the fire stopping system from water) in areas subject to wash down such as Food Service and Dish Washing Areas.

END OF SECTION

SECTION 23 05 15

PIPING SPECIALTIES

PART 1 GENERAL

1.1 SCOPE

A. This section includes specifications for piping specialties for all piping systems on this project. Included are the following topics:
   1. Part One – General
      a. Scope.
      b. Related Work
      c. Reference
      d. Quality Assurance
      e. Shop Drawings
      f. Operation and Maintenance Data
      g. Design Criteria
   2. Part 2 – Products
      a. Thermometers
      b. Thermometer Sockets
      c. Test Wells
      d. P/T (Pressure/Temperature) Test Plugs
      e. Hose Connection Caps
      f. Expansion Compensators
      g. Strainers
      h. Air Vents
      i. Flow Sensing Devices
   3. Part 3 – Execution
      a. Thermometers
      b. Thermometer Sockets
      c. Test Wells
      d. P/T (Pressure/Temperature) Test Plugs
      e. Expansion Compensators
      f. Strainers
      g. Air Vents

1.2 RELATED WORK

A. Section 23 05 23 - General-Duty Valves for HVAC Piping

B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

C. Section 23 07 00 - HVAC Insulation

D. Section 23 21 13 - Hydronic Piping

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 QUALITY ASSURANCE

A. Refer to division 1, General Conditions, Equals and Substitutions.

1.5 SHOP DRAWINGS

A. Refer to division 1, General Conditions, Submittals.

B. Required for all items in this section; Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

1.6 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.7 DESIGN CRITERIA

A. All piping specialties are to be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

PART 2 PRODUCTS

2.1 THERMOMETERS

A. Manufacturers: Ashcroft, Marsh, Taylor, H. O. Trerice, U. S. Gauge, Weiss, Weksler.

B. Stem Type, cast aluminum case, nine inch scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, red or blue indicating fluid, black lettering against a white background, with scale ranges as follows:

Service	**Scale Range, °F**	**Min. Increment, °F**
Hot Water	30 - 240	2

2.2 THERMOMETER SOCKETS

A. Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

2.3 TEST WELLS

A. Similar to thermometer sockets except with a brass cap that thread into the inside of the test well to prevent dirt from accumulating. Secure cap to body with a short chain. Furnish with extension necks, where appropriate, to accommodate the pipeline insulation.

2.4 P/T (PRESSURE/TEMPERATURE) TEST PLUGS

A. Brass plug with 1/4" NPT threads, EPDM or neoprene valve core, knurled cap with cap strap. Use extended length plugs to clear insulated piping. Adaptors shall have 1/4" FPT connection for standard pressure gauges.

2.5 HOSE CONNECTON CAPS

A. Hose connection caps shall be pressure rated for 150 psig at 180 deg F.

2.6 EXPANSION COMPENSATORS

A. Manufacturers: MetraFlex HP series, Vibrations Mountings and Controls, Hyspan, or Flexonics model H or HP.

B. Constructed of two ply stainless steel bellows with carbon steel shrouds, carbon steel threaded or flanged end fittings or copper solder joint fittings, internal guides for the full length of the bellows travel, and positive internal anti-torque device to prevent twist or torque during installation. Units to be rated at 150 psi at not less than 400°F.

2.7 STRAINERS

A. Manufacturers: Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.

B. Water Systems:
   1. Y type; cast iron body; stainless steel screens; bolted or threaded screen retainer tapped for a blow off valve; threaded body in sizes through 2 inch and rated at not less than 175 psi WOG; flanged body in sizes over 2 inch and rated at not less than 125 psi WOG at 240°F. Screen to be 20 mesh for line sizes 2 inch and less, 0.125 inch perforations for line sizes 2-1/2 inch through 4 inch, and 0.25 inch perforations for line sizes 5 inch and larger.

2.8 AIR VENTS

A. Manual Key Type Vents:
   1. Bell and Gossett Model 4V; Eaton/Dole Model 9, 9B, or 14A.
   2. Bronze body with nonferrous internal parts, screwdriver operated, designed to relieve air from the system when vent is opened, rated at not less than 125 psig at 220°F.

B. Manual Ball Valve Vents:
   1. Provide 1/4" ball valves for manual venting of air handling unit coils and where indicated elsewhere on drawings and details. Reference specifications section 23 05 23.

2.9 FLOW SENSING DEVICES

A. For water flow sensing devices 2 inch and smaller, use balance valves as specified in Section 23 05 23 - General-Duty Valves for HVAC Piping.

PART 3 - EXECUTION

3.1 THERMOMETERS

A. Stem Type
   1. Install in piping systems as indicated on the drawings and/or details using a separable socket in each location.

3.2 THERMOMETER SOCKETS

A. Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

3.3 TEST WELLS

A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for inserting a thermometer at a later date.

3.4 P/T (PRESSURE/TEMPERATURE) TEST PLUGS

A. Install in piping systems as indicated on the drawings and/or details. Do not insulate over test plugs.

3.5 EXPANSION COMPENSATORS

A. Install where indicated on the drawings or details, locating anchors and guides as detailed.

3.6 STRAINERS

A. Install all strainers where indicated on the project details, allowing sufficient space for the screens to be removed. Rotate screen retainer where required by the installation so blowdown can remove accumulated dirt from the strainer body.

B. Water Systems:
   1. Install a ball valve for blowdown in the tapped screen retainer; valve to be the same size as the tapping.

3.7 AIR VENTS

A. Manual Key Type Vents
   1. Install at all high points where air may collect and not be carried by the system fluid. Use a soft Type L copper "pigtail" so the vent can be positioned for venting and collecting any water that might escape.

B. Manual Ball Valve Vents
   1. Install on air handling coils and where indicated elsewhere as shown on drawings and details.

END OF SECTION

SECTION 23 05 23

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1 SCOPE

A. This section includes valve specifications for all HVAC systems except where indicated under Related Work. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Quality Assurance
      e. Submittals
      f. Operation and Maintenance Data
      g. Design Criteria
   2. Part 2 – Products
      a. Manufacturers
      b. Water System Valves
         1) Gate Valves
         2) Ball Valves
         3) Butterfly Valves
         4) Globe Valves
         5) Balance Valves
         6) Drain Valves
      c. Specialty Valves and Valve Accessories
         1) Gauge Valves
         2) Stem Extensions
   3. Part 3 – Execution
      a. General
      b. Shut-off Valves
      c. Balancing Valves
      d. Calibrated Balancing Valves
      e. Drain Valves

1.2 RELATED WORK

A. Section 23 05 15 - Piping Specialties

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 QUALITY ASSURANCE

A. Refer to division 1, General Conditions, Equals and Substitutions.

1.5 SUBMITTALS

A. Refer to division 1, General Conditions, Submittals.

B. Contractors shall submit a schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

1.6 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.7 DESIGN CRITERIA

A. Where valves are specified for individual mechanical services (i.e. hot water heating, steam, etc.) all valves shall be of the same manufacturer unless prior written approval is obtained from DFD.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Anvil, Apollo, Armstrong, Bell & Gossett, Cash-Acme, Dresser Consolidated, Conval, Crane, Anderson Greenwood and Crosby, Danfoss-Flomatic, DeZurik, Durco, Fisher, Grinnell, Griswold, Hammond, Hancock, Hoffman, Jamesbury, Keystone, Kunkle, Leslie, Lunkenheimer/Cincinnati, Metraflex, Milwaukee, Mueller, Newco, Nexus, Nibco, Powell, RP&C, Sarco, Spence, Stockham, Taco, Tasco, Thrush-Amtrol, Vogt, Watts, or approved equal.

2.2 WATER SYSTEM VALVES

A. All water system valves to be rated at not less than 125 psig water working pressure at 240°F unless noted otherwise.

B. Gate Valves
   1. 2" and smaller: Use ball valves; gate valves will not be accepted in sizes 2" and smaller.
   2. 2-1/2" and larger: Use butterfly valves; gate valves will not be accepted in sizes 2-1/2" and larger.

C. Ball Valve
   1. 2" and smaller: Two piece bronze body; threaded or soldered ends, as appropriate to the pipe material; stainless steel or chrome plated brass/bronze ball; conventional port; glass filled teflon seat; threaded packing gland follower; blowout-proof stem; 600 psig WOG.
   2. Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.
   3. Apollo 70-100/200 series, Hammond 8301/8311, Milwaukee BA100/150, Nibco T/S 585-70, Stockham S206/216.
   4. 2-1/2" and over: Ball valves will not be accepted in sizes over 2 inch.

D. Butterfly Valves
   1. 2" and smaller: Use ball valves; butterfly valves will not be accepted in sizes 2 inch and smaller.
   2. 2-1/2" and larger: Cast iron body; stainless steel shaft; Teflon, nylatron, or acetal bearings; EPDM resilient seat. Disk to be bronze, aluminum-bronze, nickel plated ductile iron, cast iron with welded nickel edge, or 316 - stainless steel. Pressure rated to 150 psig. Valve assembly to be bi-directionally bubble tight to 150 psig with no downstream flange/pipe attached. Nylon coated ductile iron discs are not acceptable. Polymid or polyamide coated valves are not acceptable.
   3. Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.
   4. Use threaded lug type valves for installation with class 125/150 flanges.
   5. Centerline series 200, DeZurik BOS-CL, Keystone Fig. 222, Nibco LD2000 (2-1/2”-12”)/LD1000 (14” and above), Bray Series 31H, Victaulic 300 series (2-1/2”-12”)/709 series (14”-24”).
   6. Where butterfly valves are indicated or specified to be installed at the location of a flow sensing device, provide the butterfly valves with a memory stop.

E. Globe Valves
   1. Do not use globe valves for water service, except in temperature control applications.

F. Balance Valves
   1. 2" and smaller: Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 250°F.
      a. Armstrong CBV, Bell & Gossett Circuit Setter Plus, Griswold Quickset, Nexus Orturi, Nibco 1710 Series, Taco Accu-Flo, Tour & Anderson STAS/STAD, Victaulic series 786/787.

   2. 2-1/2" and larger: Use butterfly valves as specified in this section along with a flow sensing device as specified in Section 23 05 15.

G. Drain Valves
   1. Use 3/4 inch ball valve with threaded hose adapter except strainer blowdown valves to be the same size as the blowdown connection. Provide hose connection caps pressure rated for 150 psig at 180 deg F.

2.3 SPECIALTY VALVES AND VALVE ACCESSORIES

A. GAUGE VALVES
   1. Water Service: Use 1/4" ball valves.

2.4 STEM EXTENSIONS

A. Provide stem extensions when valve operators interfere with pipe insulation.

PART 3 EXECUTION

3.1 GENERAL

A. Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.

B. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

C. Install all temperature control valves.

D. Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal position only where space limitations do not allow installation in an upright position or where large valves are provided with chain wheel operators. Where valves 2-1/2" and larger are located more than 12'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator. Valves installed with the stems down, will not be accepted.

E. Install stem extensions when shipped loose from valve.

F. Prior to flushing of piping systems, place all valves in the full-open position.

3.2 SHUT-OFF VALVES

A. Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for isolation or repair.

B. Water System
   1. Butterfly valves installed at the location of a flow sensing device are to have a memory stop.

3.3 BALANCING VALVES

A. Provide balancing valves for all major equipment and at each major branch takeoff.

3.4 CALIBRATED BALANCE VALVES

A. Install where indicated on the drawings and details for balancing of hydronic systems. Retain the shipping container for use as removable insulation.

3.5 DRAIN VALVES

A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified or detailed including reheat coils, other locations required for drainage of systems.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SCOPE

A. This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Quality Assurance
      f. Description
      g. Shop Drawings
      h. Design Criteria
   2. Part 2 – Products
      a. Pipe Hanger and Support Manufacturers
      b. Structural Supports
      c. Pipe Hangers and Supports
      d. Beam Clamps
      e. Concrete Inserts
      f. Anchors
   3. Part 3 – Execution
      a. Installation
      b. Hanger and Support Spacing
      c. Vertical Riser Clamps
      d. Anchors

1.2 RELATED WORK

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment

B. Section 23 07 00 - HVAC Insulation

1.3 REFERENCE

A. Applicable provisions of Division 1 shall govern work under this section.

1.4 REFERENCE STANDARDS

A. MSS SP-58 Materials, Design, Manufacture, Selection, Application, and Installation

1.5 QUALITY ASSURANCE

A. Refer to Division 1, General Conditions, Equals and Substitutions.

1.6 DESCRIPTION

A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.

B. Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.

C. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

D. Protect insulation at all hanger points; see Related Work above.

1.7 SHOP DRAWINGS

A. Refer to division 1, General Conditions, Submittals.

B. Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service. Reference section 23 05 00.

C. All submittals are to comply with submission and content requirements specified in specification Section 01 91 01 or 01 91 02.

1.8 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 unless noted otherwise.

B. Piping connected to base mounted pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

C. Piping flexible connections and vibration isolation supports are required for piping connected to coils that are in a fan assembly where the entire assembly is mounted on vibration supports; the vibration isolation supports are required for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Piping flexible connection and vibration isolation supports are not required when the fan section is separately and independently isolated by means of vibration supports and duct flexible connections. Standard pipe hangers/supports as specified in this section are required when there are no vibration isolation devices in the piping and beyond the 100 pipe diameter/3 support distance.

D. Piping supported by laying on the bottom chord of joists or trusses will not be accepted.

E. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

F. Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine maintenance, etc.

PART 2 PRODUCTS

2.1 PIPE HANGER AND SUPPORT MANUFACTURERS

A. Anvil, B-Line, Fee and Mason, Kindorf, Michigan Hanger, Unistrut, or approved equal. Anvil figure numbers are listed below; equivalent material by other manufacturers is acceptable.

2.2 STRUCTURAL SUPPORTS

A. Provide all supporting steel required for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

2.3 PIPE HANGERS AND SUPPORTS

A. Hangers For Steel Pipe Sizes 1/2" Through 2"
   1. Carbon steel, adjustable, clevis, black finish. Anvil figure 65 or 260.

B. Hangers For Steel Pipe Sizes 2-1/2" and Over
   1. Carbon steel, adjustable, clevis, black finish. Anvil figure 260.
   2. Adjustable steel yoke, cast iron roll, double hanger. Anvil figure 181.

C. Multiple Or Trapeze Hangers
   1. Steel channels with welded spacers and hanger rods if calculations are submitted.

D. Vertical Riser Support
   1. Carbon steel riser clamp, copper plated when used with copper pipe. Anvil figure 261 for steel pipe, figure CT121 for copper pipe.

E. Floor Support For Pipe Sizes Through 4"
   1. Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

F. Copper Pipe Support
   1. Carbon steel ring, adjustable, copper plated or polyvinylchloride coated.

G. Insulation Protection Shields
   1. Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2 inch and larger. Minimum shield length is 12 inches. Equal to Anvil figure 167.

H. Steel Hanger Rods
   1. Threaded both ends, threaded one end, or continuous threaded, black finish.
   2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
   3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)

610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8

4. Provide rods complete with adjusting and lock nuts.

2.4 BEAM CLAMPS

A. MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of 3/8, 1/2, and 5/8 inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Anvil figure 86.

B. MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter but limited in application to pipe sizes 8 inch and less without prior approval. Anvil figure 228.

2.5 CONCRETE INSERTS

A. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

2.6 ANCHORS

A. Use welding steel shapes, plates, and bars to secure piping to the structure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install supports to provide for free expansion of the piping and duct system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

B. Piping shall be supported independently from ductwork and all other trades.

C. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes for the supporting steel.

D. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

3.2 HANGER AND SUPPORT SPACING

A. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

B. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

C. Support riser piping independently of connected horizontal piping.

D. Adjust hangers to obtain the slope specified in the piping section of this specification.

E. Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Spacing
Steel	1/2" through 1-1/4"	6'-6"
Steel	1-1/2" through 6"	10'-0"
Copper	1/2" through 1-1/4"	5'-0"
Copper	1-1/2" and larger	8'-0"

3.3 VERTICAL RISER CLAMPS

A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

3.4 ANCHORS

A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SCOPE

A. This section includes air and water testing, adjusting and balancing for the entire project. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Description
      f. Pre-Installation Meeting and Scheduling
      g. Submittals
   2. Part 2 – Products
      a. Instrumentation
   3. Part 3 – Execution
      a. Preliminary Procedures
      b. Existing Equipment / Scope of Work
      c. Performing Testing, Adjusting and Balancing
      d. VAV Supply and Exhaust Duct System Static Pressure Set Point
      e. Hydronic System Differential Pressure Control Set Point
      f. Critical Room Pressure Relationships
      g. Pump Balancing
      h. Deficiencies

1.2 RELATED WORK

A. Section 23 05 00 Common Work Results for HVAC

B. Section 23 07 00 HVAC Insulation

C. Section 23 09 23 Direct Digital Control System for HVAC

1.3 REFERENCE

A. Applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. AABC National Standards for Total System Balance, Sixth Edition, 2002.

B. ASHRAE ASHRAE Handbook, 2015 HVAC Applications, Chapter 38, Testing Adjusting and Balancing.

C. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Seventh Edition, 2005.

D. TABB Tab Procedural Guide, First Edition, 2003.

1.5 DESCRIPTION

A. The Contractor will separately contract with an independent test and balance agency to perform all testing, adjusting, and balancing of air and hydronic systems required for this project. Work related to the testing, adjusting, and balancing that must be performed by the installing mechanical contractor is specified in other section of these specifications.

B. Provide total mechanical systems testing, adjusting and balancing. Requirements include the balance of air and water distribution, adjustment of new and existing systems and equipment to provide design requirements indicated on the drawings, electrical measurement and verification of performance of all mechanical equipment, all in accordance with standards published by AABC, NEBB, or TABB.

C. Test, adjust and balance all air and hydronic systems so that each room, piece of equipment or terminal device meets the design requirements indicated on the drawings and in the specifications.

D. Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of major buildings, occupancy of one building when the project involves many buildings, and completion of the entire project in the time stated in the Instruction to Bidders and in accordance with the completion schedule established for this project.

E. Verify that provisions are being made to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

1.6 QUALITY ASSURANCE

A. Qualifications
   1. An independent Firm specializing in the Testing and Balancing of HVAC systems for a minimum of 3 years. A Firm not engaged in the commerce of furnishing or providing equipment or material generally related to HVAC work other then that specifically related to installing Testing and Balancing components necessary for work in this section such as, but not limited to sheaves, pulleys, and balancing dampers.
   2. A certified member of AABC or certified by NEBB or TABB in the specific area of work performed. Maintain certification for the entire duration of the project. If certification of firm or any staff performing work is terminated or expires during the duration of the project, contact A/E immediately.
   3. Technicians on this project must have satisfactorily completed work on a minimum of (3) three projects of at least 50% in size, and of similar complexity. Size is defined as the quantity of each specific individual item requiring testing and balancing such as, but not limited to, equipment, devices, terminal devices, and grilles and diffusers.
   4. Submit Qualifications of firm and project staff to A/E and Owners Representative when requested.

1.7 PRE-INSTALLATION MEETING AND SCHEDULING

A. The test and balance agency is required to attend a pre-installation meeting with all other project contractors before the construction process is started. The test and balance agency shall give the Mechanical Contractor a detailed schedule of testing and balancing tasks for incorporation into the project schedule.

1.8 SUBMITTALS

A. See also Related Work in this section.

B. Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB, AABC or TABB Certified Test and Balance Supervisor. The reports certify that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.

C. Format:
   1. Cover page identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions:
      a. General Information
      b. Summary
      c. Air Systems
      d. Hydronic Systems

D. Contents: Provide the following minimum information, forms and data:
   1. General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.
   2. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.
   3. The remainder of the report to contain the appropriate standard NEBB, AABC, or TABB forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable indicate same.

PART 2 PRODUCTS

2.1 INSTRUMENTATION

A. Provide all required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements to be in accordance with the requirements of NEBB, AABC, or TABB Standards and instrument manufacturer's specifications.

B. All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination by A/E upon request. Calibration and maintenance of all instruments to be in accordance with the requirements of NEBB, AABC, or TABB Standards

PART 3 EXECUTION

3.1 PRELIMINARY PROCEDURES

A. Review preconstruction meeting report, applicable construction bulletins, applicable change orders and approved shop drawings of equipment, outlets/inlets and temperature controls.

B. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation and hydronic systems for proper charge and purging of air.

C. Notify Owners Project Representative on a daily basis during balancing. Identify deficiencies preventing completion of testing, adjusting and balancing procedures. Do not proceed until systems are fully operational with all components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

3.2 EXISTING EQUIPMENT / SCOPE OF WORK

A. The following shall be tested, adjusted and balanced:
   1. All new and existing air terminal units within the project area (airflow and water flow).
   2. Al new supply grilles (within the project area).
   3. All new return grilles (within the project area).
   4. All existing wall fin radiation (with the project area).
   5. Existing hot water reheat circulation pumps (located in 3rd Floor Mechanical Room).

3.3 PERFORMING TESTING, ADJUSTING AND BALANCING

A. Perform testing, adjusting and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards except as may be modified below.

B. Unless specifically instructed in writing, all work in this specification section is to be performed during the normal workday.

C. In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is complete and provide new tile for any tile that are damaged by this procedure. If the ceiling construction is such that access panels are required for the work of this section and the panels have not been provided, inform the owner's project representative.

D. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

E. In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.

F. Measure and record system measurements at the fan and/or pump to determine total flow. Adjust equipment as required to yield specified total flow at terminals. Proceed taking measurements in mains and branches as required for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.

G. Measure and record static air pressure conditions across fans, coils and filters. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty filter. Spot check static air pressure conditions directly ahead of terminal units.

H. Adjust register, grille and diffuser vanes and accessories to achieve proper air distribution patterns and uniform space temperatures free from objectionable noise and drafts within the capabilities of the installed system.

I. Provide fan and motor drive sheave adjustments necessary to obtain design performance. Provide drive changes specifically noted on drawings, if any. If work of this section indicates that any drive or motor is inadequate for the application, advise the owner's project representative by giving the representative properly sized motor/drive information (in accordance with manufacturers original service factor and installed motor horsepower requirements); Confirm any change will keep the duct/piping system within its design limitations with respect to speed of the device and pressure classification of the distribution system. Required motor/drive changes not specifically noted on drawings or in specifications will be considered an extra cost and will require an itemized cost breakdown submitted to owner's project representative. Prior authorization is needed before this work is started.

J. Areas or rooms designed to maintain positive, negative or balanced air pressures with respect to adjacent spaces, as indicated by the design air quantities, require special attention. Adjust fan drives, distribution dampers, terminals and controls to maintain indicated pressure relationship.

K. Final air system measurements to be within the following range of specified cfm:
   1. Fans 0% to +10%
   2. Supply grilles, registers, diffusers 0% to +10%
   3. Return/exhaust grilles, registers 0% to -10%

L. Final water system measurements must be within the following range of specified gpm:
   1. Heating flow rates 0% to -10%

M. Contact the temperature control Contractor for assistance in operation and adjustment of controls during testing, adjusting and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.

N. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.

O. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

P. Verify and record, in the T&B Report, "K" factors for all VAV air terminal devices and air flow stations.

3.4 VAV SUPPLY DUCT SYSTEM STATIC PRESSURE SET POINT

A. For VAV supply air terminal devices, determine the minimum required duct static pressure at the DDC static pressure sensor location(s) needed to insure that all VAV air terminals are operating at their design airflows with the most demanding VAV terminal wide open. Provide these static pressure numbers to the DDC temperature controls contractor and record them in the T&B report for each system.

3.5 HYDRONIC SYSTEM DIFFERENTIAL PRESSURE CONTROL SET POINT

A. For hydronic systems with variable speed pumping, determine the minimum required system differential pressure set point needed to insure that all terminal devices are operating at their design water flows with the most demanding terminals device control valve wide open. Provide the differential control setting set point to the DDC temperature control contractor and record them in the T&B report for each system.

3.6 PUMP BALANCING

A. For HVAC pumps 10 horsepower or less, valve throttling alone may be used for hydronic system balancing.

B. Throttling of triple-duty valves shall not exceed 50% closed. Where additional throttling would be necessary to achieve the system design flow the impellor shall be trimmed.

C. Verify Triple duty valve utilized on systems with Variable Frequency Drives are 100% open when balancing work is complete.

3.7 DEFICIENCIES

A. Division 23 00 00 contractor to correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work. Test and balance agency will notify the A/E of these items and instructions will be issued to the Division 23 00 00 contractor for correction of the deficient work. All corrective work to be done at no cost to the Owner or A/E. Retest mechanical systems, equipment, and devices once corrective work is complete as specified.

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.1 SCOPE

A. This section includes insulation specifications for heating, ventilating and air conditioning piping, ductwork and equipment. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Quality Assurance
      f. Description
      g. Definitions
      h. Shop Drawings
      i. Operation and Maintenance Data
      j. Environmental Requirements
   2. Part 2 – Products
      a. Materials
      b. Insulation Types
      c. Adhesives, Mastics, Sealants, and Reinforcing Materials Jackets
      d. Insulation Inserts and Pipe Shields
      e. Accessories
   3. Part 3 – Execution
      a. Examination
      b. Installation
      c. Protective Jacket Installation
      d. Piping, Valve and Fitting Insulation
      e. Pipe Insulation Schedule
      f. Duct Insulation
      g. Duct Insulation Schedule
      h. Equipment Insulation
      i. Equipment Insulation Schedule

1.2 RELATED WORK

A. Section 23 05 00 - Common Work Results for HVAC

B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

C. Section 23 21 13 - Hydronic Piping

D. Section 23 31 00 - HVAC Ducts and Casings

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. ASTM International
1. ASTM B209 Aluminum and Aluminum Alloy Sheet and Plate
2. ASTM C165 Test Method for Compressive Properties of Thermal Insulations
3. ASTM C177 Heat Flux and Thermal Transmission Properties
4. ASTM C195 Mineral Fiber Thermal Insulation Cement
5. ASTM C302 Density of Preformed Pipe Insulation
6. ASTM C272 Water Absorption of Core Materials for Sandwich Constructions
7. ASTM C303 Density of Preformed Block Insulation
8. ASTM C355 Test Methods for Test for Water Vapor Transmission of Thick Materials
9. ASTM C518 Heat Flux and Thermal Transmission Properties
10. ASTM C533 Calcium Silicate Block and Pipe Thermal Insulation
11. ASTM C534 Preformed Flexible Elastomeric Thermal Insulation
12. ASTM C547 Mineral Fiber Preformed Pipe Insulation
13. ASTM C552 Cellular Glass Block and Pipe Thermal Insulation
14. ASTM C553 Mineral Fiber Blanket and Felt Insulation
15. ASTM C578 Preformed, Block Type Cellular Polystyrene Thermal Insulation
16. ASTM C591 Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
17. ASTM C612 Mineral Fiber Block and Board Thermal Insulation
18. ASTM C921 Properties of Jacketing Materials for Thermal Insulation
19. ASTM C1136 Flexible Low Permeance Vapor Retarders for Thermal Insulation
20. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
21. ASTM D1000 Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
22. ASTM D1621 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
23. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics
24. ASTM D1940 Method of Test for Porosity of Rigid Cellular Plastics
25. ASTM D2126 Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
26. ASTM D2240 Standard Test Method for Rubber Property—Durometer Hardness
27. ASTM D5590 Test Method for Determining the Resistance of Coatings to Fungal Defacement
28. ASTM E84 Surface Burning Characteristics of Building Materials
29. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems
30. ASTM E2336 Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems

B. MICA National Commercial & Industrial Insulation Standards

C. NFPA 225 Surface Burning Characteristics of Building Materials

D. UL 723 Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

A. Refer to division 1, General Conditions, Equals and Substitutions

B. Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

C. Insulation systems shall be applied by experienced contractors. Within the past five (5) years, the contractor shall be able to document the successful completion of a minimum of three (3) projects of at least 50% of the size and similar scope of the work specified in this section.

1.6 DESCRIPTION

A. Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:
   1. Pipe Insulation
   2. Duct Insulation
   3. Equipment Insulation

B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the A/E.

1.7 DEFINITIONS

A. Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

1.8 SHOP DRAWINGS

A. Refer to division 1, General Conditions, Submittals.

B. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

1.9 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not store insulation materials on grade or where they are at risk of becoming wet. Do not install insulation products that have been exposed to water.

B. Protect installed insulation work with plastic sheeting to prevent water damage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers: Armacell, CertainTeed, Manson, Childers, Dow, Extol, Fibrex, Halstead, Foster, Imcoa, Johns Manville, Knauf, Owens-Corning, , Pittsburgh Corning, , VentureTape or approved equal.

B. Materials or accessories containing asbestos will not be accepted.

C. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:
   1. Pipe insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 450 when tested in accordance with UL 723 and ASTM E84.

2.2 INSULATION TYPES

A. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

B. Flexible Fiberglass Insulation
   1. Minimum nominal density of 0.75 lbs. per cu. ft., and thermal conductivity of not more than 0.30 at 75 degrees F, rated for service to 250 degrees F.

C. Rigid Fiberglass Insulation
   1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, 0.25 at 125 degrees F, 0.27 at 150 degrees F, 0.29 at 200 degrees F, 0.32 at 250 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

D. Calcium Silicate Insulation
   1. Rigid hydrous calcium silicate, ASTM C533, Type I, minimum dry density of 12.5 lbs. per cu. ft., thermal conductivity of not more than 0.44 at 300 degrees F, maximum water absorption of 90% by volume, minimum compressive strength 140 psi at 5% deformation, rated for service range of 0 degrees F to 1,200 degrees F,. Material to be visually coded or marked to indicate it is asbestos free.

2.3 ADHESIVES, MASTIC, SEALANTS, AND REINFORCING MATERIALS

A. Products shall be compatible with surfaces and materials on which they are applied, and shall be suitable for use at operating temperatures of systems to which they are applied.

B. Fiberglass Insulation Adhesive
   1. Must comply with ASTM C916, Type II: Foster 85-60, Childers CP-127, Duro Dyne SSG.

C. Insulation Joint Sealant (cellular glass, polyisocyanurate, phenolic)

1. Used on all below ambient piping to prevent moisture ingress. Foster 95-50 Flextra, Childers CP-76 Chil-Byl, Pittsburgh Corning CW Sealant.

2.4 JACKETS

A. PVC Fitting Covers And Jackets (PFJ)
   1. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be minimum .02" indoors/.03"outdoors for piping 12" and smaller, .03" indoors/.04" outdoors for piping 15" and larger.

B. All Service Jackets (ASJ)
   1. Heavy duty, fire retardant material with white kraft reinforced foil vapor retarding jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

C. Foil Scrim All Service Jackets (FSJ)
   1. Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum permeance of .02 perms and minimum beach puncture resistance of 25 units.

2.5 INSULATION INSERTS AND PIPE SHIELDS

A. Manufacturers: B-Line, Pipe Shields, Value Engineered Products.

B. Construct inserts with calcium silicate or polyisocyanurate (service temperatures below 300 degrees F only), minimum 140 psi compressive strength. Piping 12" and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.

C. Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered/premanufactured product described above. On low temperature systems, high density rigid polyisocyanurate may be substituted for calcium silicate provided insert and shield length and shield gauge are increased to compensate for lower insulation compressive strength.

D. Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of the same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1"x6" block for piping through 2-1/2" and three 1"x6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to pre-engineered/premanufactured product described above.

E. Wood blocks will not be accepted.

2.6 ACCESSORIES

A. All products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of the systems to which they are applied.

B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

C. Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015 inch for aluminum and 0.010 inch for stainless steel.

D. Tack fasteners to be stainless steel ring grooved shank tacks.

E. Staples to be clinch style.

F. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

G. Finishing cement to be ASTM C449.

H. Joint sealants and metal jacketing sealants to be non-shrinking and permanently flexible.

I. Vapor retarding coatings to have maximum applied water vapor permeance of 0.03 perms or less at 45 mils dry as tested by ASTM E96.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that all piping, equipment, and ductwork are tested and approved prior to installing insulation. Do not insulate systems until testing and inspection procedures are completed.

B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

3.2 INSTALLATION

A. All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards. Do not install products when the ambient temperature or conditions are not consistent with the manufacturer's recommendations. Surfaces to be insulated must be clean and dry.

B. Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation.

C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates.

D. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.

E. Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

F. All pipe and duct insulation shall be continuous through walls, ceiling or floor openings and through sleeves except where firestop or firesafing materials are required. Vapor retarding jacket shall be maintained continuous through all penetrations.

G. Provide a continuous unbroken moisture vapor retarding jacket on insulation applied to systems noted below. Attachments to cold surfaces shall be insulated and vapor sealed to prevent condensation.

H. Provide a complete vapor retarding jacket for insulation on the following systems:
   1. Insulated Duct
   2. Equipment, ductwork or piping with a surface temperature below 65 degrees F

3.3 PROTECTIVE JACKET INSTALLATION

A. PVC Fitting Covers And Jackets (PFJ)
   1. Lap seams and joints a minimum of 2 inches and continuously seal PVC with welding solvent recommended by jacket manufacturer. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction. For sections where vapor retarding jacket is not required and jacket requires routine removal, tack fasteners may be used. Secure PVC fitting covers with tack fasteners. For systems requiring a vapor retarding jacket, apply a 1-1/2" band of mastic over ends, throat, seams and penetrations.

B. All Service Jackets (ASJ) and Foil Scrim All Service Jackets (FSJ)
   1. Install according to manufacturer's recommendations using factory supplied lap seals and butt strip seals.

C. Vapor Retarding Jackets (VRJ)
   1. Piping with vapor retarding jackets (VRJ) shall have elbows, fittings, valves and butt joints wrapped with 2 layers of vapor retarding tape. Piping with a PVC jacket (PFJ) installed over the vapor retarding jackets (VRJ) may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket. Vapor retarding tape shall be compatible with the jacket material used.

3.4 PIPING, VALVE, AND FITTING INSULATION

A. General
   1. Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive unless otherwise noted. Additionally secure with staples along seams and butt joints.
   2. On systems requiring a vapor retarding jacket, seal off all raw ends of insulation and butt joints with vapor retarding mastic at intervals of not more than 20 feet on piping. Coat staples, longitudinal and transverse seams with vapor retarding mastic and on systems requiring vapor retarding jacket, coat insulated elbows, fittings, and valves with vapor retarding mastic.
   3. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor retarding jacket is not required or where roller hangers are not being used, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod

penetration. Where riser clamps are required to be attached directly to piping requiring vapor retarding jacket, extend insulation and vapor retarding jacketing/coating around riser clamp.

4. Where insulated piping is installed on hangers and supports, the insulation shall be installed continuous through the hangers and supports. High density inserts shall be provided as required to prevent the weight of the piping from crushing the insulation. Pipe shields are required at all support locations. The insulation shall not be notched or cut to accommodate the supporting channels.
5. Fully insulate all reheat coil piping, fittings and valves (with the exception of unions) up to coil connection to prevent condensation when coil is inactive during cooling season. Provide a vapor proof seal between the pipe insulation and the insulated coil casing.

B. Insulation Inserts And Pipe Shields
1. Provide pipe shields at all hanger and support locations. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Quantity and placement of inserts shall be according to the manufacturer's installation instructions, however the inserts shall be no less than 12" in length. Inserts shall be of equal thickness to the adjacent insulation and shall be vapor sealed as required for system.
2. Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.

C. Fittings And Valves
1. Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up insulation of the same thickness as adjoining insulation. Where the ambient temperature exceeds 150 degrees F, cover insulation with fabric reinforcing and mastic. Where the ambient temperatures do not exceed 150 degrees, furnish and install PVC fitting covers.

3.5 PIPE INSULATION SCHEDULE

A. Provide insulation on new and existing remodeled piping as indicated in the following schedule:

SERVICE	INSULATION	JACKET	INSULATION THICKNESS BY PIPE SIZE				
			< 1"	1" to < 1-1/2"	1-1/2" to < 4"	4" to < 8"	8" and Larger
Heating Hot Water	Rigid Fiberglass	ASJ	1.5"	1.5"	2"	2"	2"

B. The following piping and fittings are not to be insulated
1. Hot water piping inside radiation, convector, or cabinet heater enclosures
2. Piping unions for systems not requiring a vapor retarding Jacket

C. For systems with fluid temperatures 65° F or less, furnish and install removable elastomeric insulation covers, plugs or caps for all mechanical equipment and devices that require access by balancing contractors or service and maintenance personnel. Examples include but are not limited to: flow sensing devices, circuit setters, manual ball valve air vents, drain valves, blowdown valves, pressure/temperature test plugs, grease fittings, pump bearing caps, equipment labels, etc. Covers shall be tight fitting to ensure a complete vapor retarding barrier.

3.6 DUCT INSULATION

A. General

1. Secure flexible duct insulation on sides and bottom of ductwork over 24" wide and all rigid duct insulation with weld pins. Space fasteners 18" on center or less as required to prevent sagging.
2. Secure rigid board insulation to ductwork with weld pins. Apply insulation with joints firmly butted as close as possible to the equipment surface. Pins shall be located a maximum of 3" from each edge and spaced no greater than 12" on center.
3. Install weld pins without damage to the interior galvanized surface of the duct. Clip pins back to washer and cover penetrations with tape of same material as jacket. Firmly butt seams and joints and cover with 4" tape of same material as jacket. Seal tape with plastic applicator and secure with staples. All joints, seams, edges and penetrations to be fully vapor sealed with vapor retarding mastic.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.
5. External supply duct insulation is not required where ductwork contains continuous 1" acoustical liner. Provide 4" overlap of external insulation over ends of acoustically lined sections.
6. Where insulated ductwork is supported by trapeze hangers, the insulation shall be installed continuous through the hangers. Drop the supporting channels required to facilitate the installation of the insulation. Where rigid board or flexible insulation is specified, install high density inserts to prevent the weight of the ductwork from crushing the insulation.
7. Where insulated low temperature (below 45ºF) ductwork is supported by steel metal straps or wire ropes that are secured directly to the duct, the straps or ropes shall be completely covered with insulation and sealed to provide a complete vapor retarding barrier.
8. Where insulated duct risers are supported by steel channels secured directly to the duct, extend the insulation and vapor retarding jacketing to encapsulate the support channels.

3.7 DUCT INSULATION SCHEDULE

A. Provide duct insulation on new and existing remodeled ductwork in the following schedule:

SERVICE	INSULATION TYPE	JACKET	THICKNESS
Mixed air ducts	Rigid Fiberglass	FSJ	2"
Exposed supply ducts*	Rigid Fiberglass	FSJ	2"
Concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2"
Exhaust and relief ducts downstream of motorized backdraft dampers	Rigid Fiberglass	FSJ	2"

* Exposed supply branch ducts located in the space they are serving do not require insulation. Exposed supply main ducts running through spaces they serve shall be insulated as exposed supply ducts scheduled above.

** Insulating value of any louver or curb blank off panel needs to meet the building envelope insulating value required by current building code.

3.8 EQUIPMENT INSULATION

A. General
   1. Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.

3.9 EQUIPMENT INSULATION SCHEDULE:

A. Provide equipment insulation as follows:

EQUIPMENT	INSULATION TYPE	JACKET	THICKNESS
Reheat coil casing in exposed supply ducts	Rigid Fiberglass	FSJ	2”
Reheat coil casing in concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2”

END OF SECTION

SECTION 23 09 23

DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 SCOPE

A. The existing building utilizes a Niagara based direct digital control (DDC) system. This project will add new air terminal units and sections of wall fin radiation with DDC control that will be integrated into the existing building Niagara based DDC system. This project shall provide:
   1. All new Distech controllers required to integrate (18) new VAV air terminals into the existing building automation system.
   2. New hot water reheat DDC temperature control valves for new VAV air terminals.
   3. New hot water DDC temperature control valves for existing hot water perimeter radiation.
   4. New space Distech temperature sensors associated with each VAV air terminal.
   5. New Distech controls for the control of (1) TF-1 for data closet cooling.
   6. All control wiring (low and line voltage) for a complete operating system.
   7. Update of existing 4th floor City County Building automation graphics to include new and existing air terminals, wall fin radiation, convectors, etc. associated with this project.
   8. Tie in of all new controllers to the existing JACE8 controller on the 5th floor.

B. All new air terminals and air terminal controls shall be integrated into the Niagara based DDC system.

C. All new controllers and space thermostats shall be Distech, following City County Building protocols.

D. All new controllers, control wiring and temperature control valves shall follow current City County Building protocols to provide building continuity in regard to controllers, wiring and equipment.

E. Work in this section includes Direct Digital Control (DDC) panels, main communication trunk, software programming, and other equipment and accessories necessary to constitute a complete Direct Digital Control (DDC) system. This system interfaced with pneumatic/electric controls (Section 23 09 14) utilizing Direct Digital Control signals to operate actuated control devices will meet, in every respect, all operational and quality standards specified herein.
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Other Work
      f. Quality Assurance
      g. Submittals
      h. Operation and Maintenance Data
      i. Material Delivery and Storage

2. Part 2 – Products
    a. General
    b. Direct Digital Controls (DDC)
    c. Local Control Panels
    d. Networking/Communications
    e. Control Valves
    f. Thermostats
    g. VAV Controllers (Application Specific Controllers)
    h. Supervisory Controllers
    i. Software License Agreement
    j. Operator Interface Requirements
3. Part 3 – Execution
    a. General
    b. Installation
    c. Training
    d. Commissioning, Verification and Closeout
    e. Sequence of Operation
    f. Input/Output Points List

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination

C. Division 23 - HVAC - Equipment provided to be controlled or monitored

D. Division 26 - Electrical - Equipment provided to be controlled or monitored

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. FCC Part 15, Subpart J, Class A - Digital Electronic Equipment to Radio Communication Interference

1.5 OTHER WORK

A. The A/E must properly coordinate the necessary power wiring.

1.6 QUALITY ASSURANCE

A. Manufacturer:
    1. Distech controllers and field devices to be integrated into the existing Niagara based building automation system / front end. No other manufacturers will be considered.

B. Installer:
    1. The installer shall be specialized and experienced in Distech / Niagara DDC control systems and installation for not less than 5 years. All engineering work shall be done by

qualified employees of Distech / Niagara, or qualified employees of an Distech / Niagara Authorized Representative that provides engineering and commissioning of Distech / Niagara control equipment. Where installing contractor is an authorized representative of Distech / Niagara, submit written confirmation of such authorization. Indicate in letter of authorization that the installing contractor has successfully completed all necessary training required for the engineering, installation, and commissioning of equipment and systems to be provided for the project and that such authorization has been in effect for a period of not less than three years. The letter of authorization should also indicate that the installing contractor is authorized to install Distech / Niagara DDC equipment at the project location at the time the project is bid. Installation of the equipment shall be done by qualified mechanics and/or electricians in the direct employ or be directly subcontracted and under the supervision of Distech / Niagara or Authorized Distech / Niagara Representative. The contractor providing and installing the equipment under this specification section shall be the same contractor providing and installing equipment under the 23 09 14 specification section.

2. The only acceptable installing contractor for this project are:
   a. CBRE|ESI
      3410 Gateway Road
      Brookfield, WI 53045
   b. MTI
      701 Morley Road
      Green Bay, WI 54303

C. Response Time
   1. During warrantee period, four (4) hours or less, 24-hours/day, 7 days/week.

D. Electrical Standards
   1. Provide electrical products, which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.

E. DDC Standards
   1. DDC manufacturer shall provide written proof with shop drawings that the equipment being provided is in compliance with F.C.C. rules governing the control of interference caused by Digital Electronic Equipment to Radio Communications (Part 15, Subpart J, Class A).

1.7 SUBMITTALS

A. Include the following information:
   1. Details of construction, layout, and location of each temperature control panel within the building, including instruments location in panel and labeling. Indicate which piece of mechanical equipment is associated with each controller and what area within the building is being served by that equipment. For terminal unit control, provide a room schedule that would list mechanical equipment tag, room number of space served, address of DDC controller, and any other pertinent information required for service.
   2. Product Data
      a. Submit manufacturer's specifications for each control device furnished, including installation instructions and startup instructions. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked. Annotated software program documentation shall be submitted for system sequences, along with descriptive narratives of the sequence of operation of the

entire system involved. Submit wiring diagram for each electrical control device along with other details required to demonstrate that the system has been coordinated and will function as a system.

3. Maintenance Data
   a. Submit maintenance data and spare parts lists for each control device. Include this data in maintenance manual.
4. Record Drawings
   a. Prior to request for final payment provide complete composite record drawings to incorporate the control work. All software addressing for device communication shall be noted for all devices provided under this section and the communication addressing required for devices provided by others that are integrated into the direct digital control system provided under this section. Point to point routing of communication trunks and power wiring between DDC controllers, DDC communication devices, control panels, and Ethernet switches shall be documented. Coordinate with the supplier of the equipment specified to be interfaced through digital communications for communication addressing. Provide circuit number of 120VAC panel power circuit(s) feeding each control panel on record drawings. Label circuit number(s) inside the panel served.

1.8 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.9 MATERIAL DELIVERY AND STORAGE

A. Provide factory shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide DDC control products in sizes and of capacities as required, conforming to manufacturer's standard materials and components as published in their product information, designed and constructed as recommended by the manufacturer and as required for application indicate.

B. System shall be capable of operating with 120 VAC power supply, fully protected with a shutdown-restart circuit, and associated hardware and software.

2.2 DIRECT DIGITAL CONTROLS

A. Provide extension of existing direct digital building automation system to the area of renovation. System to be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection.

B. DDC to consist of Supervisory Controllers, Programmable Controllers and stand-alone Application Specific Controllers (ASC's) as required.

C. The vendor of the system provided under this Section shall provide all software and communication interface hardware necessary to program and upload/download programmable and application specific controllers from a laptop computer and make additional copies and future software revisions available for sale directly to the user Agency.

D. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASC's, and operator devices.

E. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

2.3 LOCAL CONTROL PANELS

A. Use existing local control panels if adequately sized. If not, provide new/adjacent local control panel. Use control panels with suitable mounting brackets for each supply fan system. Locate panel adjacent to system served.

B. Fabricate panels of 14 gauge furniture grade steel or 6063-T5 extruded aluminum alloy, totally enclosed on six sides, hinged door and keyed lock, with manufacturer's standard shop painted finish and color.

C. Provide UL listed cabinets for use with line voltage devices.

D. Control panels that have devices or terminations that are fed or switch 50V or higher shall enclose the devices, terminations, and wiring so that Personal Protective Equipment (PPE) is not required to service the under 50V devices and terminations within the control panel. As an alternative, a separate panel for only the 50V and higher devices may be provided and mounted adjacent to the under 50V control panel. For DDC controllers that are directly fed by 120VAC, provide an externally mounted 120VAC, 5A fast blow fuse to feed these controllers.

E. Plastic control enclosures will be approved provided all conduits are bonded and grounded.

F. Provide control panels for all DDC Controllers, ASC's and associated function modules. All controls to be in control panels provided under this Section except for the following:
   1. Terminal unit controllers mounted within the terminal unit equipment enclosure.
   2. Above accessible lay-in tile ceilings where VAV box controllers designed to be directly mounted on air terminals.
   3. Above accessible lay-in tile ceilings where additional controllers are required for air terminal unit control. Where additional controllers are required, they shall not be mounted directly to the ductwork but be mounted on din rail or back panel in an accessible location as close as possible to the terminal unit(s) being controlled.
   4. Any devices other than DDC controllers, i.e. relays, pressure switches, etc. shall be installed in an enclosure.

G. Provide terminal unit equipment enclosures with removable cover for all terminal units located in exposed ceilings or in mechanical rooms that completely enclose the DDC controller and allow for conduit terminations.

H. All wiring for controllers shall be managed in a neat and workmanlike manner.

I. Permanently label all controls; tag all control wiring, and document both on control drawings.

2.4 NETWORKING/COMMUNICATIONS

A. The design of the DDC shall be networked. The highest level networking shall use Ethernet and the sub-level networking shall use serial communications. Inherent in the system's design shall be the ability to expand or modify the highest network either via a local area network (LAN), wide area network (WAN), or a combination of the two schemes.

B. The highest-level DDC communications network shall be capable of direct connection to and communication with a high-speed LAN or WAN utilizing an Ethernet connection.

C. The supervisory controller shall directly oversee a local network such that communications may be executed directly to and between programmable controllers and ASC's. All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all points and application reports on the network.

D. Provide serial communication ports on all ASC's for operator's terminal communications with the DDC Controller.

E. Access to system data shall not be restricted by the hardware configuration of the DDC system.

F. Global data sharing or global point broadcasting shall allow point data to be shared between programmable controllers and ASC's when it would be impractical to locate multiple sensors.

2.5 CONTROL VALVES

A. Manufacturer: Belimo (Valve and Actuator) only.

B. Provide all control valves as shown on the plans/details and as required to perform functions specified. Spring ranges must be selected to prevent overlap of operation and simultaneous heating and cooling.

C. Size operators to allow smooth and positive operation of devices served and to provide sufficient torque capacity for tight shutoff against system temperatures and pressure encountered. Use fully proportional actuators with 0-10VDC inputs and zero and span adjustments unless specified otherwise. If TriState with feedback is specified, valve position shall be fed back to the controller and controller shall position valve based on this feedback. Electric actuators, for applications other than terminal units, shall be provided with a manual override capability. All electric actuators shall be provided with a visible position indicator.

D. All power required for electric actuation shall be provided by this contractor if it is not able to be directly provided from the DDC controller.

E. Provide operators that are full proportioning or two-position, as required for specified sequence of operation.

F. Provide operators with linkages and brackets for mounting on device served.

G. All valves unless specifically noted on the plans or indicated below shall be ball style valves.

VALVE SERVING	TYPE	SIGNAL	SPRING RETURN	FAIL POSITION
Reheat Coil	Ball	0-10 VDC	No	Last Position
Perimeter Radiation	Valve - Belimo – B215HT186 (1/2", Cv=1.86) Actuator – Belimo – TR24-SR US			

H. Use equal percentage valves for two-way control valves; size for a pressure drop not less than 4 psi or more than 6 psi. Note: For low flows, the required minimum Cv size will result in lower pressure drop than 4 psi.

I. Globe valves 2" and smaller: Cast bronze or forged brass body, brass plug and brass or stainless steel seat, stainless steel stem, screwed ends, suitable for use on water systems at 150 psig and 240° F. Seat leakage with actuator supplied will meet ANSI class IV leakage (0.01%). For globe valves that are specified to fail in place, valves shall be open when the stem is up. Only the following globe valve body styles will be acceptable for terminal unit control. Valves and actuators shall be by Belimo.

2.6 THERMOSTATS

A. Thermostats shall be by Distech.

B. Thermostats shall match existing thermostats (finish and functionality) located in adjacent areas of the City County Building.

C. Terminal unit space sensors shall be provided with digital displays with setpoint adjustments and manual occupancy override and indication of occupancy status. Provide information to the AE on sensor colors offered by the manufacturer and obtain approval on what color should be provided on the project. Provide setpoint adjustment as specified in the DDC Input/Output Summary Table and sequence of operation

2.7 VAV CONTROLLERS (APPLICATION SPECIFIC CONTROLLERS)

A. VAV controllers (ECB-VAV) shall be by Distech. No others will be allowed.

B. Provide minimum of 12 point VAV controller.

C. Each supervisory controller shall be able to extend its monitoring and control through the use of stand-alone application specific controllers (ASC's).

D. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor based, multi-tasking, real-time digital control processor.

E. Each ASC shall have sufficient memory to support its own operating system and databases including:
   1. Control Processes
   2. Energy Management Applications
   3. Operator I/O (Portable Service Terminal)

F. The operator interface to any ASC point or program shall be through the supervisory controller connection to any ASC on the network.

G. ASC's shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following information for the:
   1. Display temperatures
   2. Display status
   3. Display setpoints
   4. Display control parameters
   5. Override binary output control
   6. Override analog output control
   7. Override analog setpoints
   8. Modification of gain and offset constants

H. All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.

I. ASC's shall support, but not be limited to, the following configurations of systems to address current requirements as described in Sections 23 09 14 and 23 09 93 portions of this specification, and for future expansion of air handling units:
   1. Variable Air Volume Terminals
   2. Reheat Terminals

J. For butterfly type Variable Air Volume (VAV) Terminals, provide differential pressure transducers and damper actuators for flow measurement and actuation of the VAV terminal damper. Pressure transducers for VAV box flow applications do not need to have adjustable pressure ranges or integral display. Provide filter on high side of flow pickups if flow measurement device requires airflow through the device. All differential pressure transducer inputs for airflow measurement shall have a method to compensate for sensor drift to calibrate the zero point of the input. The differential pressure transducers and damper actuators can be integrated into the terminal unit controller or be discrete devices.

K. Provide a method to view and print a summary of current K-factors for flow correction for each VAV terminal through the DDC system. The summary shall have a minimum of 50 K-factors per group of VAV terminals.

L. All system setpoints, proportional bands, control algorithms, calibration constants, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.

M. All application specific controllers shall be fully programmable. Question and answer or template programming is not acceptable unless this is used to generate the initial application program and the result is able to be freely modified without restriction. Control sequences for terminal unit control that utilize devices wired directly to the terminal unit application controller shall be programmed in the application specific controller and shall be stand-alone in function, i.e. occupancy sensing, temperature setpoint setback, etc. Supervisory controllers shall not be involved in the control sequence logic unless it involves sharing data between or from individual terminal unit controllers to be utilized in a global sequence, i.e. trim and respond strategies, terminal unit grouping, etc.

2.8 SUPERVISORY CONTROLLERS

A. The existing JACE8 controller located on the 5th floor of the City County Building shall be used as the supervisory controller for this project.

2.9 SOFTWARE LICENSE AGREEMENT

A. For Niagara based systems, it is the express goal of this specification to implement an open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The user Agency shall be the named license holder of all software associated with any and all incremental work on the project(s). All Niagara software licenses shall have the "accept.station.in=*"; "accept.station.out=*" and "accept.wb.in=*" and "accept.wb.out=*" section of the software licenses. The intent is to ensure that the installed Niagara products may be completely open for integrations. The user Agency shall be free to direct the modification of the any software license, regardless of supplier. In addition, the user Agency shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required Ids and passwords for access to any component or software program shall be provided to the user Agency. Provide all software necessary for developing software algorithms in all supervisory, programmable, and application specific direct digital controllers which is licensed to the owner

B. Programming tools for programmable and application specific controllers that utilize the Niagara Framework shall not be restricted to any specific brand of Jace. Tools and controllers shall be able to connect to any brand of Jace that are provided under this specification Section.

2.10 OPERATOR INTERFACE REQUIREMENTS

A. The existing web-based browser interface and graphic-based display shall be used, expanded and modified to reflect the floor plan and direct digital control modifications and expansions as required as part of this project.

PART 3 EXECUTION

3.1 GENERAL

A. All electronic work required as an integral part of the Direct Digital Control system work is the responsibility of this section unless specifically indicated otherwise in this section, Section 23 09 14, or in Division 26.

B. This contractor shall provide all labor, materials, engineering, software, permits, tools, checkout and certificates required to install a complete Direct Digital Control system as herein specified.

C. Any and all points added with this project shall be grouped for display purposes into the system such that all points associated with a new or existing DDC system can appear together

on the flat panel display or printed log. Assignment of points to a group shall not be restricted by hardware configuration of the points of direct digital control. It shall be possible to assign a point to appear in more than one system. An English descriptor and an alpha/numeric identifier shall identify each system.

D. This Direct Digital Control system as herein specified shall be fully integrated and completely installed by this section. It shall include all required computer CPU software and hardware. Include the engineering, installation, supervision, calibration, software programming, and checkout necessary for a fully operational system.

3.2 INSTALLATION

A. All work and materials are to conform in every detail to the rules and requirements of the National Electrical Code and present manufacturing standards. All wiring and cable installation shall conform with the wiring installation as specified in the installation section of Section 23 09 14. All material shall be UL approved.

B. Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details on drawings.

C. Line voltage wiring to power the DDC Controllers, not provided by the Division 26 contractor, to be by this contractor.

D. Control panels serving equipment fed by emergency power shall also be served by emergency power.

E. Provide uninterruptable power supplies where necessary to provide proper startup of equipment or to accomplish power restart control sequences specified.

F. Label all control devices with the exception of dampers, valves, and terminal unit devices with permanent printed labels that correspond to control drawings. Temperature control junction and pullboxes shall be identified utilizing spray painted green covers. Other electrical system identification shall follow the 26 05 53 specification.

G. All control devices and electrical boxes mounted on insulated ductwork shall be mounted over the insulation. Provide mounting stand-offs where necessary for adequate support. Cutting and removal of insulation to mount devices directly on ductwork is not acceptable. This contractor shall coordinate with the insulation contractor to provide for continuous insulation of ductwork.

H. Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components. Install all high voltage and low voltage wiring (includes low voltage cable) in rigid metal conduit. All conduit must be installed in accordance with electrical sections (Division 26) of this specification and the National Electrical code.

I. Conduit shall be a minimum of 1/2 " for low voltage control provided the pipe fill does not exceed 40%.

J. Minimum low voltage wiring gauge to be 18 AWG for outputs and 20 AWG for inputs. All low voltage wiring to be stranded.

K. Low voltage wiring can be run without conduit above accessible lay-in tile ceilings. All wiring in mechanical rooms, above inaccessible hard ceilings, exterior locations, and in any exposed areas, and in all other locations should be in conduit. Wire for wall sensors must be run in conduit. Wiring for radiation valves shall be run in conduit where routed through walls.

L. Where wiring is installed free-air, installation shall consider the following:
   1. Wiring shall utilize the cable tray wherever possible.
   2. Wiring shall run at right angles and be kept clear of other trades work.
   3. Wiring shall be supported utilizing "J" or "Bridal-type" steel mounting rings anchored to ceiling concrete, piping supports, walls above ceiling or structural steel beams. Mounting rings shall be of open design (not a closed loop) to allow additional wire to be strung without being threaded through the ring. For mounting rings that do not completely surround the wire, attach the wire to the mounting ring with a strap.
   4. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If wiring "sag" at mid-span exceeds 6-inches; another support shall be used.
   5. Wiring shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
   6. Wall penetrations shall be sleeved.

M. Wiring shall not be attached to existing cabling, existing tubing, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.

N. Mount control panels adjacent to associated equipment on vibration-free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and on cabinet face.

O. Provide as-built control drawings of all systems served by each local panel in a location adjacent to or inside of panel cover. Provide a protective cover or envelope for drawings.

P. All tubing, cable and individual wiring is to be permanently tagged, with numbers corresponding with "Record Drawings", spares are to be labelled as "Spare".

Q. Cable tray routing of the communication trunks is acceptable.

3.3 TRAINING

A. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 8 hours over (2) separate days.

B. Provide two follow-up visits for troubleshooting and instruction, one 30 days after substantial completion and the other 90 days after substantial completion. Length of each visit to be not less than 4 hours or the time necessary to provide required information and complete troubleshooting and inspection activity for all controls. Coordinate the visit with the owner and provide an inspection report to the owner of any deficiencies found.

3.4 COMMISSIONING, VERIFICATION AND CLOSEOUT

A. Provide technician to work with air balancing contractor and/or provide balancing contractor with necessary hardware to over-ride DDC controllers for air balancing.

B. Provide documentation to demonstrate that all points, input and output, have been checked out and verified operational, note any points not operating properly with notation of reason.

C. At the completion of the temperature controls system installation, and prior to substantial completion, the temperature control contractor shall verify and commission all HVAC building controls to verify all systems are calibrated, under control and functioning as specified and designed. Commissioning, verification and closeout shall include at a minimum:
   1. Verification that all points, alarms and equipment are integrated into the BAS and are graphically represented (accurately).
   2. Air Terminal Units with Reheat
      a. Damper operation and control.
      b. Reheat temperature control valve or stages of operation.
      c. Occupied / Unoccupied setpoints and deadbands.
      d. Occupancy sensor integration.
      e. Sensor integration and calibration
         1) Discharge air temperature
         2) Space thermostat.
         3) Space humidity.
         4) Space CO.
      f. Interlock and control with perimeter radiation (if installed).
   3. Coordinate all space temperature setpoints and schedules with the tenant and facilities engineer. Record all setpoints and schedules. Include in the Operation and Maintenance Manuals.

D. Temperature control contractor shall provide temperature control system self-commissioning and closeout report indicating systems commissioned and that all systems are functioning as specified and designed. This report, at a minimum shall include the following:
   1. Verification that all points and equipment are integrated into the BAS and are graphically represented (accurately).
   2. Date commissioned.
   3. Air Terminal Units with Reheat
      a. Unit ID.
      b. Control valve or stages of operation.
      c. Occupied / Unoccupied setpoints and deadbands.
      d. Verification that sensors are calibrated and integrated.

E. Contractor to provide all documentation in a written report. Report shall be signed and dated that all systems have been commissioned and verified to be in working order in accordance with plans and specifications.
   1. Submit final report for review by the Owner, Owners Agent and A/E.
   2. Include final report in the Operation and Maintenance manuals.

3.5 SEQUENCE OF OPERATION

A. Variable Air Volume Terminals with Hot Water Reheat

1. Systems consist of:
    a. Variable air volume terminal
    b. Hot water reheat coil with 2-way or 3-way temperature control valve.
    c. DDC space sensor.
    d. Lighting Occupancy Sensor (Sensor provided and installed by electrical contractor, Large Conference Room Only).
2. Provide all line and low voltage wiring for a complete operating system.
3. Provide a DDC space temperature sensor to control, in sequence, a modulating electronic control valve for the hot water reheat coil and actuator for terminal air flow. When space temperature is below setpoint, the air terminal damper shall modulate toward the cooling minimum flow position. After the air terminal damper is at its minimum flow, the hot water valve shall modulate open to maintain space temperature. If the air terminal has a heating airflow, the hot water control valve and air terminal shall open in parallel.
4. The reverse shall occur when space temperature is below setpoint. The heating coil valve shall be commanded closed whenever the associated AHU is off. Provide a discharge air temperature sensor for monitoring purposes.
5. Each space temperature sensor shall have a manual override button that shall index the space to the occupied mode for a period of two hours (adj.). If an occupancy sensor is specified, it shall index the terminal unit DDC controller to occupied mode for a minimum of 30 minutes (adj.).
6. Provide separate adjustable cooling and heating setpoints for both the occupied and unoccupied modes. When the space temperature is between the heating and cooling setpoints, the heating valve shall be closed and the airflow at heating and cooling minimum flow.
7. Occupancy sensors will be provided by the Division 26 contractor. Provide wiring from all occupancy sensor contacts to building automation system for space occupied/unoccupied control. When the occupancy sensor signals the zone is unoccupied, the minimum flow setpoint shall be zero CFM (adj.) and the heating and cooling temperature setpoints will be maintained at either the occupied or unoccupied heating and cooling setpoints as defined by the weekly schedule (grouped or individually). When the occupancy sensor signals the zone is occupied, the occupied minimum flow setpoint shall be as scheduled and the occupied heating and cooling temperature setpoints shall be maintained regardless of the weekly schedule. All programming for the above sequence shall reside in the terminal unit controller and a supervisory controller shall not be required to reset any flow or temperature setpoints based on the occupancy sensor.
8. Where there are multiple occupancy sensors associated with a VAV zone that serves multiple spaces, all occupancy sensors must be “unoccupied” for the air terminal to move to zero airflow setpoint.

B. Variable Air Volume Terminals with Hot Water Reheat and Perimeter Radiation
1. Systems consist of:
    a. Variable air volume terminal
    b. Hot water reheat coil with 2-way or 3-way temperature control valve.
    c. Existing hot water convector with new 2-way DDC control valve and actuator
    d. DDC discharge air sensor.
    e. DDC space sensor.
2. Provide all line and low voltage wiring for a complete operating system.
3. Mount discharge air temperature sensor a minimum of 3 duct diameters downstream of reheat coil

4. Provide a DDC space temperature sensor to control, in sequence, a modulating electronic control valve for the hot water reheat coil and actuator for terminal air flow. When space temperature is below setpoint, the air terminal damper shall modulate toward the cooling minimum flow position. After the air terminal damper is at its minimum flow, the hot water reheat valve and perimeter radiation valve shall modulate open in parallel to maintain space temperature.
5. The reverse shall occur when space temperature is below setpoint.
6. The heating coil valves shall be commanded closed whenever the associated AHU is off. Provide a discharge air temperature sensor for monitoring purposes.
7. Each space temperature sensor shall have a manual override button that shall index the space to the occupied mode for a period of two hours (adj.). If an occupancy sensor is specified, it shall index the terminal unit DDC controller to occupied mode for a minimum of 30 minutes (adj.).
8. Provide separate adjustable cooling and heating setpoints for both the occupied and unoccupied modes. When the space temperature is between the heating and cooling setpoints, the heating valve shall be closed and the airflow at heating and cooling minimum flow.
9. In the unoccupied mode, the perimeter radiation shall be enabled to provide unoccupied heating.

C. Transfer Fan TF-1
   1. Systems consist of:
      a. Ceiling exhaust fan.
      b. DDC space temperature sensor.
   2. Provide all line and low voltage wiring for a complete operating system.
   3. On a rise above space temperature above setpoint, as sensed by the reverse acting thermostat, TF-1 shall be energized and operate.
   4. On a drop in space temperature below setpoint, as sensed by the reverse acting thermostat, TF-1 shall stop.
   5. The DDC space temperature sensor shall monitor and alarm space temperature to the BAS.

END OF SECTION

DDC INPUT / OUTPUT SUMMARY TABLE

PROJECT: RFB No. 319034	HARDWARE																	SOFTWARE																										
LOCATION: Madison, WI	OUTPUT								INPUT									ALARMS						ENERGY MANAGEMENT SYSTEM FUNCTIONS																				
	DIGITAL				ANALOG				DIGITAL						ANALOG							DIGITAL			ANALOG																				
Air Terminal Units / POINT DESCRIPTION	Control Relay	24VAC	Contactor	2-Pos Actuator	Tri-State Actuator	Duration Adjust Actuator	4-20 mA	0-10 VDC	Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	Temperature	Relative Humidity	Differential Pressure	Gauge Pressure	Static Pressure	Flow	Equipment Status	Maintenance	Pressure	High Limit	Low Limit			Day/Night Setback	Demand Limiting	Dial-up I/O	Duty Cycling	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend		Equipment Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Boiler Integeration	Dry-bulb Economizer	HW/OA Reset	OA Lockout	Smoke Control	Fire Alarm Override	Comments
AIR TERMINALS																																											
Zone Temperature															X									X	X									X										
Temperature Setpoint Adjust																																												Integral w/Sensor
Unnocupied Override Button											X																																	Integral w/Sensor
Occupancy Sensor												X																																
Supply Air Damper [1 & 2]					X	X	X	X										X																										
Supply Air Flow																			X															X										
Discharge Air Temperature															X																			X										
Reheat Valve [1]					X	X	X	X																										X										
Perimeter Radiation Valve [1]					X	X	X	X																										X										
TF-1																																												
Fan On/Off	X														X									X									X										
Fan Status									X																																		
Data Room Space Temp															X									X	X									X										

Notes:

1. Analog outputs must utilize a calculated proportional command from software. Actual output can be any type but floating outputs shall have feedback from the acutator so actual actuator position is known.
2. Damper actuators can utilize stepper type motors.

SECTION 23 21 13

HYDRONIC PIPING

PART 1 GENERAL

1.1 SCOPE

A. This section contains specifications for all HVAC hydronic pipe and pipe fittings for this project. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Shop Drawings
      f. Quality Assurance
      g. Delivery, Storage, and Handling
      h. Design Criteria
      i. Welder Qualifications
   2. Part 2 – Products
      a. Heating Hot Water
      b. Unions and Flanges
      c. Gaskets
      d. Mechanical Grooved Pipe Connections
   3. Part 3 – Execution
      a. Erection
      b. Welded Pipe Joints
      c. Threaded Pipe Joints
      d. Copper Pipe Joints
      e. Water Systems
      f. Unions and Flanges
      g. Gaskets
      h. Piping System Leak Tests
      i. Hydronic Piping System Flushing
      j. Piping System Leakage Test Report
      k. Piping System Flushing Report

1.2 RELATED WORK

A. Section 23 05 15 - Piping Specialties

B. Section 23 05 23 - General-Duty Valves for HVAC Piping

C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

D. Section 23 07 00 - HVAC Insulation

E. Section 23 25 00 - HVAC Water Treatment.

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. ANSI B16.3 Malleable Iron Threaded Fittings

B. ANSI B16.4 Cast Iron Threaded Fittings

C. ANSI B16.5 Pipe Flanges and Flanged Fittings

D. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

E. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

F. ASTM A74 Cast Iron Soil Pipe and Fittings

G. ASTM A105 Forgings, Carbon Steel, for Piping Components

H. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

I. ASTM A181 Forgings, Carbon Steel for General Purpose Piping

J. ASTM A197 Cupola Malleable Iron

K. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

L. ASTM A380 Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems

M. ASTM B75 Seamless Copper Tube

N. ASTM B88 Seamless Copper Water Tube

1.5 SHOP DRAWINGS

A. Refer to division 1, General Conditions, Submittals.

B. Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.

C. Type F Steel Pipe
   1. Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.

D. Type E or S Steel Pipe

1. Mill certification papers, also known as material test reports, for the pipe furnished for this project, in English. Heat numbers on these papers to match the heat numbers stenciled on the pipe. Chemical analysis indicated on the mill certification papers to meet or exceed the requirements of the referenced ASTM specification.

E. Copper Tube
   1. Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.

1.6 QUALITY ASSURANCE

A. Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.8 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

C. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

D. Where ASTM A53 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E or S may be substituted at Contractor's option. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

E. Where ASTM B88, type L hard temper copper tubing is specified, ASTM B88, type K hard temper copper tubing may be substituted at Contractor's option.

1.9 WELDER QUALIFICATIONS

A. Before any metallic welding is performed, the Contractor shall submit his Standard Welding Procedure Specifications, Procedure Qualification Records and Qualification Test Records for each Welder along with associated continuity records to demonstrate compliance with ASME Section IX, paragraph QW-322.

B. The Contractor shall maintain a complete set of welder qualification documents at the jobsite, including Test Records and Continuity Records for each welder.

C. The A/E or owner reserves the right to test the work of any welder employed on the project, at the Contractor's expense. Testing will include a visual examination of the pipe and weld and may include radiography of any suspect welds. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project. Any welds deemed unacceptable will be repaired at the contractor’s expense.

PART 2 PRODUCTS

2.1 HEATING HOT WATER

A. 2" and Smaller: ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, class 125, standard weight cast iron threaded fittings.

B. 2-1/2" and Larger: ASTM A53, standard weight (schedule 40) black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

C. Contractor may use ASTM B88 seamless, type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings in lieu of steel pipe for all sizes. Mechanically formed tee fittings may be used in lieu of wrought copper solder-joint tee fittings for branch takeoff up to one-half (1/2) the diameter of the main.

2.2 UNIONS AND FLANGES

A. 2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use ANSI B16.18 cast copper alloy unions on copper piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

B. 2-1/2" and Larger: ASTM A181 grade I or A105, grade III hot forged steel flanges of threaded, welding and of a pressure class compatible with that specified for valves, piping specialties and fittings of the respective piping service. Flanges smaller than 2-1/2" may be used as needed for connecting to equipment and piping specialties. Use raised face flanges ANSI B16.5 for mating with other raised face flanges on equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment.

C. Provide ASTM A 193 B7 grade bolts and A 194 2H grade nuts & hardened washers for connections (Star washers for grounding.)

2.3 GASKETS

A. Water and Glycol Systems: Branded, compressed, non-asbestos sheet gaskets. Klingersil C4401, Garlock 3000, JM Clipper 978 or approved equal.

2.4 MECHANICAL GROOVED PIPE CONNECTIONS

A. Will not be allowed for this project.

PART 3 EXECUTION

3.1 ERECTION

A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be rejected and removed from the job site immediately. Excluding minor surface rust, piping that exhibits significant oxidation or corrosion will be rejected.

B. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.

C. Remove all lose dirt, scale, oil, chips, burrs and other foreign material from the internal and external surfaces of all pipe and piping components prior to assembly, including debris associated with cutting, threading and welding.

D. During fabrication and assembly, remove slag and weld spatter from internal pipe surfaces at all joints by peening, chipping and wire brushing.

E. During construction, until system is fully operational, keep all openings in piping and equipment closed except when actual work is being performed on that item of the system. Use plugs, caps, blind flanges or other items designed for this purpose.

F. Furnish and install all flanges, caps, bypasses, drains, valves, etc. required to facilitate flushing and draining all heating and cooling system piping.

G. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

H. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

I. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

J. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

K. Install drains throughout the systems to permit complete drainage.

L. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

M. Install all valves, control valves, and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section.

3.2 WELDED PIPE JOINTS

A. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable.

B. All pipe welding shall be completed by Qualified Welders in accordance with the Contractor's Procedure Specifications.

C. Contractor will ensure that these steps are followed where pipe sections will be joined by welding:
   1. Cleaning – Welding surfaces will be clean and free of defects.
   2. Alignment – Inside diameter of piping components will be aligned as accurately as possible. Internal misalignment shall not exceed 1/16".
   3. Spacing – Pipe sections will be spaced to allow deposition of weld filler material through the entire weld joint thickness.
   4. Girth Butt Welds:
      a. Girth butt welds shall be complete penetration welds.
      b. Concavity will not exceed 1/32"
      c. Under cuts will not exceed 1/32"
      d. As welded surfaces are permitted however surfaces will be free from coarse ripples, grooves, abrupt ridges and valleys.

D. Electrodes shall be Lincoln, or approved equal, with coating and diameter as recommended by the manufacturer for the type and thickness of work being done.

3.3 THREADED PIPE JOINTS

A. Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.4 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.

B. Where mechanically formed tee fittings are allowed, form mechanically extracted collars in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. Use an adjustable collaring device. Notch and dimple the branch tube. Remove all debris created by the forming process from the inside of the pipe. Braze the joint, applying heat properly so that pipe and tee do not distort; remove distorted connections.

3.5 WATER SYSTEM

A. Run water mains level or pitch horizontal mains up 1 inch in 40 feet in the direction of flow. Install manual air vents at all high points where air may collect. If vent is not in an accessible location, extend air vent piping to the nearest code acceptable drain location with vent valve located at the drain.

B. Main branches and runouts to terminal equipment may be made at the top, top 45 degree, side, and/or bottom 45 degree of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located at all top and top 45 degree connections. Bottom connections are not acceptable unless approved by the DFD Mechanical Inspector.

C. Use top or top 45 degree connection to main for upfeed risers and bottom 45 degree connection to main for downfeed risers. Bottom connections are not acceptable unless approved by the DFD Mechanical Inspector.

D. Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping systems. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.

E. Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

3.6 UNIONS AND FLANGES

A. Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.7 GASKETS

A. Store horizontally in cool, dry location and protect from sunlight, water and chemicals. Inspect flange surfaces for warping, radial scoring or heavy tool marks. Inspect fasteners, nuts and washers for burrs or cracks. Replace defective materials.

B. Align flanges parallel and perpendicular with bolt holes centered without using excessive force. Center gasket in opening. Lubricate fastener threads, nuts and washers with lubricant formulated for application.

C. Draw flanges together evenly to avoid pinching gasket. Tighten fasteners in cross pattern sequence (12 – 6 o'clock, 3 – 9 o'clock, etc.), one pass by hand and four passes by torque wrench at 30% full torque, 60% full torque and two passes at full torque per ASME B16.5.

3.8 PIPING SYSTEM LEAK TESTS

A. Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired, and ready for operation. If required for the additional pressure load under test, provide temporary restraints at expansion joints or isolate them during the test. Verify that hangers can withstand any additional weight load that may be imposed by the test.

B. Provide all piping, fittings, blind flanges, and equipment to perform the testing.

C. Conduct pressure test with test medium of air or water unless specifically indicated. Minimum test time is indicated in the table below; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the Division's representative. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

D. Do not insulate pipe until it has been successfully tested.

E. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

F. Testing shall be as follows:

System	Pressure	Medium	Duration
Heating Hot water	100 psig	Water	8 hr

All pressure tests are to be documented on form included in this specification.

G. On piping that cannot be tested because of connection to an active line, provide temporary blind flanges and hydrostatically test new section of piping. After completion of test, remove temporary flanges and make final connections to piping. Die penetrate test pass weld or x-ray the piping that was not hydrostatically tested up to the active system.

3.9 HYDRONIC PIPING SYSTEM FLUSHING

A. All new chilled water and heating hot water system piping shall be flushed thoroughly before the systems are put in to operation. Subsequent to executing the chemical cleaning processes specified in Section 23 25 00 – HVAC WATER TREATMENT, and prior to adding scale and corrosion inhibitors, flush all piping and components with a clean source of water until the discharge from the system is clean. Discharge shall be from drains provided at all low points in the piping, ends of headers and as otherwise necessary to flush and drain the entire system.

END OF SECTION

PIPING SYSTEM LEAKAGE TEST REPORT

Date Submitted: _____

Project Name: _____

Location: _____ JDR Project No: _____

Contractor: _____

□ HVAC □ Refrigeration □ Controls
□ Power Plant □ Plumbing □ Sprinkler
Test Medium: □ Air □ Water □ Other _____

Test performed per specification section No. _____

Specified Test Duration _____ Hours Specified Test Pressure _____ PSIG

System Identification: _____

Describe Location: _____

_____

Test Date: _____

Start Test Time: _____ Initial Pressure: _____ PSIG

Stop Test Time: _____ Final Pressure: _____ PSIG

Tested By: _____ Witnessed By: _____

Title: _____ Title: _____

Signed: _____ Signed: _____

Date: _____ Date: _____

Comments: _____

_____

_____

PIPING SYSTEM FLUSHING REPORT

Date Submitted: _____

Project Name: _____

Location: _____ JDR Project No: _____

Contractor: _____

System Identification (check one):

❒ Chilled Water ❒ Process Chilled Water ❒ Heat Reclaim

❒ Heating Hot Water ❒ Heat Pump Water

Describe procedure: _____

_____

_____

Flush Date: _____ Start Time: _____ Stop Time: _____

Pressure of Water Source: _____ PSIG Describe water source and method of connection to source:

_____

_____

_____

Flushed By: _____ Witnessed By: _____

Title: _____ Title: _____

Company: _____ Company: _____

Signed: _____ Signed: _____

Date: _____ Date: _____

Describe results: _____

_____

_____

SECTION 23 25 00

HVAC WATER TREATMENT

PART 1 GENERAL

1.1 SCOPE

A. This section includes specifications for chemical treatment of all water, steam, and condensate systems. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Reference
      c. Related Work
      d. Quality Assurance
      e. Shop Drawings
      f. Operation and Maintenance Data
      g. Design Criteria
      h. Maintenance Service
   2. Part 2 – Products
      a. Manufacturers
      b. System Cleaner
      c. System Inhibitor
      d. Algaecides
      e. Glycol
      f. Closed Water System Treatment
   3. Part 3 – Execution
      a. Preparation
      b. Cleaning Sequence
      c. Closed Water Systems
   4. Appendix
      a. Pipe Cleaning and Treatment Report

1.2 REFERENCE

A. Applicable provisions of Division 1 shall govern work under this Section.

B. RELATED WORK
   1. Section 23 05 15 - Piping Specialties

C. QUALITY ASSURANCE
   1. Refer to division 1, General Conditions, Equals and Substitutions.

D. SHOP DRAWINGS
   1. Refer to division 1, General Conditions, Submittals.
   2. Required for all equipment and chemicals specified including data concerning dimensions, capacities, materials of construction, weights, operating sequence, composite wiring diagrams and appropriate identification. Chemical data to include the description of the chemical, its composition, its function, and the associated material safety data sheet.

1.3 OPERATION AND MAINTENANCE DATA

A. Provide for the services of the manufacturer's trained representative to approve the installation and instruct the user agency in the operation of each system.

B. Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.4 DESIGN CRITERIA

A. This project will be responsible for flushing and cleaning of all new hot water piping in the areas of renovation only. The existing hot water heating loop currently has a chemical treatment system installed.

B. All chemicals used must be compatible with the existing chemical treatment system

1.5 MAINTENANCE SERVICE

A. Not required. The County currently has a contractor for chemical treatment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Betz Entac, Dearborn Div. - W. R. Grace & Co., Fremont Industries, Mitco Water Labs, Mogul Corporation, Nalco Chemical Co., Western Water Management, or approved equal.

2.2 SYSTEM CLEANER

A. Blend of organic alkaline penetrants, emulsifiers, surfactants and corrosion inhibitors that remove grease and petroleum products from the interior of piping systems. Cleaners that contain trisodium phosphate are specifically not acceptable.

2.3 SYSTEM INHIBITOR

A. Scale and corrosion inhibitor consisting of boron nitrite, benzol thiazol, benzotriazole, mercapto-benzo-thiazole, and tolyltrizole silicates.

2.4 CLOSED WATER SYSTEM TREATMENT

A. Sequestering agent to reduce deposits and adjust pH: polyphosphate.

B. Corrosion inhibitors: boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

C. Conductivity enhancers: phosphates or phosphonates.

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to cleaning, verify that systems are operational, filled, started, and vented. Use water meter to record capacity in each system.

B. Place terminal control valves in the full-open position

3.2 CLEANING SEQUENCE

A. General
   1. Systems are to be cleaned before they are used for any purpose except conduct pressure test before cleaning. Add cleaner to closed systems at concentrations as recommended by the manufacturer. Remove water filter elements from the system before starting circulation. For steam systems, fill boilers only, using the water and cleaner solution.
   2. Use neutralizer agents on recommendation of the system cleaner supplier and approval of the Architect/Engineer.
   3. Flush open systems with clean water for one hour minimum. Drain completely and refill.
   4. Remove, clean, and replace strainer screens.
   5. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.
   6. Use attached form to document system cleaning, flushing, and proper startup.

B. Hot Water Heating Systems
   1. Add cleaner to the system water until the M alkalinity value is 250 above that of the initial fill water. Verify the M alkalinity level before and after the addition of the cleaner by means of chemical tests that are observed by the Owner's construction representative; include results of all tests in the Operating and Maintenance manuals. Apply heat while circulating, slowly raising temperature to 160°F and maintain for 12 hours minimum; vent all high points to assure 100% system circulation. Remove heat and circulate to 100°F or less; drain system as quickly as possible and refill with clean water. Circulate for 6 hours at design temperature, vent air at all high points, then drain. Refill with clean water and repeat until the system cleaner is removed and the M alkalinity level returns to normal. Remove and clean all strainers. Re-vent the system and install clean filter elements in water filters. Treat with scale and corrosion inhibitors before using the system for building heating or cooling.

3.3 CLOSED WATER SYSTEMS

A. The existing building chemical treatment system will be used for treating the existing, expanded hot water heating loop.

B. Prior to allowing the new hot water piping to be tied into the existing building hot water heating loop, all new piping must be pressure tested and cleaned as indicated above, with documentation (Pipe Cleaning and Treatment Report). Prior to allowing building hot water to circulate thru new piping and return back to the building, notify City County Building Facilities Personnel that the new piping connection is ready for use.

PIPE CLEANING AND TREATMENT REPORT

Date Submitted:_____

Project: Name:_____
Location:_____
Contractor:_____

System Tested: Hot Water___ Glycol Water___ Chilled Water___ Fuel Oil____
Condensor Water___ Steam___ Condensate___

System Volume:_____

Materials Used (Provide MSDS for each)

Cleaner:_____Quantity Used:_____
Inhibitor:_____Quantity Used:_____
Sequestering Agent:_____Quantity Used:_____
Algaecide:_____ Quantity Used:_____
Neutralizer:_____Quantity Used:_____
Glycol:_____Quantity Used:_____
Glycol Solution Water Source:_____Percent glycol by volume:___

M Alkalinity

Prior to Cleaning:_____ During Cleaning:_____ After Flushing:_____

System Temperature

Prior to Cleaning:_____ During Cleaning:_____

Duration	Date/Time Start	Date/Time Stop
Initial Circulation	_____	_____
Draindown	_____	_____
System Refill	_____	_____
Final Circulation	_____	_____
Heating system Warmup	_____	_____

Component Checklist (Describe procedures performed at each)

Strainers:_____

Filters:_____

Vents:_____

Drains:_____

BranchLines:_____

TerminalUnits:_____

Comments:_____

_____

_____

END OF SECTION

SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SCOPE

A. This section includes specifications for all duct systems used on this project. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Quality Assurance
      f. Shop Drawings
      g. Design Criteria
   2. Part 2 – Products
      a. General
      b. Ductwork Pressure Class
      c. Materials
      d. High Temperature Flexible Duct
      e. High Pressure Ductwork (Pressure class 3 inch and over)
      f. Low Pressure Ductwork (Maximum 2 inch pressure class)
      g. Duct Sealant
      h. Gaskets
   3. Part 3 – Execution
      a. Installation
      b. High Pressure Duct (Pressure class 3 inch and over)
      c. Low Pressure Duct (Maximum 2 inch pressure class)
      d. Cleaning
      e. Leakage Test

1.2 RELATED WORK

A. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

B. Section 23 33 00 – Air Duct Accessories

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this Section.

1.4 REFERENCE STANDARDS

A. ASTM International
   1. ASTM B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   2. ASTM A90 Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

3. ASTM A623 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM A527 Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
5. ASTM 924 Standard Specification for General Requirements for Sheet Steel, Metallic-coated by the Hot-dip Method
6. ASTM C 1071 Specification for Fibrous Glass Duct Lining Insulation
7. ASTM C 411 Test Method for Hot Surface Performance of High Temperature Thermal Insulation
8. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials
9. ASTM C 1338 Test Method for Determining Fungal Resistance of Insulation Materials and Facings
10. ASTM G 21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
11. ASTM C 916 Standard Specification for Adhesives for Duct Thermal Insulation

B. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

C. UL 181 Standard for Safety for Factory Made Air Ducts and Air Connectors.

D. NAIMA Fibrous Glass Duct Liner Standard

1.5 QUALITY ASSURANCE

A. Refer to division 1, General Conditions, Equals and Substitutions.

1.6 SHOP DRAWINGS

A. Refer to Division 1, General Conditions, Submittals.
   1. Include manufacturer's data and/or Contractor data for the following:
      a. Schedule of duct systems including material of construction, gauge, pressure class, system class, method of reinforcement, joint construction, fitting construction, and support methods, all with details as appropriate.
      b. Duct sealant and gasket material.
      c. Duct liner including data on thermal conductivity, air friction correction factor, and limitation on temperature and velocity.

1.7 DESIGN CRITERIA

A. Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.

B. Use material, weight, thickness, gauge, construction and installation methods as outlined in the following SMACNA publications, unless noted otherwise:
   1. HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
   2. HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012
   3. HVAC Systems - Duct Design, 4th Edition, 2006
   4. Rectangular Industrial Duct Construction Standard, 2nd Edition, 2004
   5. Round Industrial Duct Construction Standards, 2nd Edition, 1999

C. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

1.8 DELIVERY, STORAGE AND HANDLING

A. Promptly inspect shipments to ensure that Ductwork is undamaged and complies with the specification.

B. Protect ductwork against damage.

C. Protect ductwork by storing inside or by durable, waterproof, above ground packaging. Do not store material on grade. Protect Ductwork from dirt, dust, construction debris and foreign material. Where end caps/packaging are provided, take precautions so caps/packaging remain in place and free from damage.

D. Offsite storage agreements do not relieve the contractor from using proper storage techniques.

E. Storage and protection methods must allow inspection to verify products.

PART 2 PRODUCTS

2.1 GENERAL

A. All sheet metal used for construction of duct shall be 24 gauge or heavier except for round and spiral ductwork and spiral duct take-offs 12" and below may be 26 gauge where allowed in SMACNA HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005.

B. Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net, inside of liner.

2.2 DUCTWORK PRESSURE CLASS

A. Minimum acceptable duct pressure class, for all ductwork except transfer ductwork, is 2 inch W.G. positive or negative, depending on the application. Transfer ductwork minimum acceptable duct pressure class is 1 inch W.G. positive or negative, depending on the application. Duct system pressure classes not indicated on the drawings to be as follows:

1.	Supply duct upstream of VAV boxes	4.0 in. pressure class
2.	Supply duct downstream of VAV terminals	2.0 in. pressure class
3.	Transfer air ducts	2.0 in. pressure class
4.	Return air ducts	2.0 in. pressure class

2.3 MATERIALS

A. Galvanized Steel Sheet
   1. Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90. Provide "Paint Grip" finish or galvanneal sheetmetal for ductwork that will be painted.

2.4 HIGH PRESSURE DUCTWORK (Pressure class 3 inch and over)

A. Manufacturers: Ajax, Semco, United Sheet Metal, Sheet Metal Connectors or approved equal.

B. Machine formed round and/or flat oval spiral lock seam duct constructed of galvanized steel.

C. Rectangular high pressure duct using a transverse joint system as manufactured by Ductmate, Nexus, TDC, TDF, or approved equal, may be used at contractor's option. Duct to be flanged, gasketed and sealed.

D. Contractor fabricated ductwork meeting specified construction standards is acceptable with prior approval of Architect/Engineer. Submit construction details, a description of materials to be used, type of service, reinforcing methods, and sealing procedures.

E. Use a perforated inner liner on double wall high-pressure duct. Annular space between inner liner and outer duct to be filled with 1 inch glass fiber insulation.

F. Use cemented slip joints with 2 inch minimum overlap, flanged connections, or welded/brazed connections, unless noted otherwise for special applications. Prime coat welded joints.

G. Provide standard 90 degree conical tee takeoffs except for exhaust at velocities over 2000 feet per minute, use 45° lateral connections; straight taps or bullhead tees are not acceptable.

H. Internal bracing will not be accepted on ductwork below 48 inches.

I. Use turning vanes as specified in Section 23 33 12.

J. Provide bellmouth fittings or expanded fittings at each duct connection to air plenums.

K. Provide pressure relief fittings as indicated on the plans and/or details.

L. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.

2.5 LOW PRESSURE DUCTWORK (Maximum 2 inch pressure class)

A. Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA recommendations, except as modified below.

B. Construct so that all interior surfaces are smooth. Use slip and drive or flanged and bolted construction when fabricating rectangular ductwork. Use spiral lock seam construction when fabricating round spiral ductwork. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than 1/2 inch into the duct.

C. Use elbows and tees with a center line radius to width or diameter ratio of 1.5 wherever space permits. When a shorter radius must be used due to limited space, install single wall sheet metal splitter vanes in accordance with SMACNA publications, Type RE 3. Where space will not allow and the C value of the radius elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes as specified in Section 23 33 00. Square throat-radius heel elbows will not be acceptable. Straight taps or bullhead tees are not acceptable.

D. Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00.

E. Provide expanded take-offs or 45 degree entry fittings for branch duct connections with branch ductwork airflow velocities greater than 700 fpm. Square edge 90-degree take-off fittings or straight taps will not be accepted.

F. Button punch snaplock construction will not be accepted on aluminum ductwork.

G. Round ducts may be substituted for rectangular ducts if sized in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission of the Architect/Engineer.

H. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

2.6 DUCT SEALANT

A. Manufacturer: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peal & Seal, Lockformer cold sealant, Mon-Eco Industries, United Sheet Metal, or approved equal. Silicone sealants are not allowed in any type of ductwork installation.

B. Install sealants in strict accordance with manufacturer's recommendations, paying special attention to temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of air handling systems.

2.7 GASKETS

A. 2 inch pressure class and lower
   1. Soft neoprene or butyl gaskets in combination with duct sealant for flanged joints.

B. 3 inch pressure class and higher
   1. Butyl gaskets.

PART 3 EXECUTION

3.1 INSTALLATION

A. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect in the event of any interference.

B. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct Construction Standards, Figure 4-7, except do not reduce duct to less than six inches in any dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as indicated in SMACNA HVAC Duct Construction Standards, Figure 4-8, Fig. E. In all cases, seal to

prevent air leakage. Pipes or similar obstructions may not pass through high pressure or fume exhaust ductwork.

C. Test openings for test and balance work will be provided under Section 23 05 93.

D. Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in duct systems, and make all connections to such equipment including equipment furnished by others. Secure frames with gaskets and screws or nut, bolts and washers.

E. Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to form watertight joints.

F. Where two different metal ducts meet, the joint shall be installed in such a manner that metal ducts do not contact each other by using proper seal or compound.

G. Install all motor operated dampers and connect to or install all equipment furnished by others. Blank off all unused portions of louvers, as indicated on the drawings, with 1-1/2 inch board insulation with galvanized sheet metal backing on both sides.

H. Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room or space.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. Provide adequate access to ductwork for cleaning purposes.

K. Provide temporary capping of ductwork openings to prevent entry of dirt, dust and foreign material.

L. Protect diffusers, registers and grilles with plastic wrap or some other approved form of protection to maintain dirt and dust free and to prevent entry of dirt, dust and foreign material into the Ductwork.

M. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.2 DUCTWORK SUPPORT

A. Support ductwork in accordance with SMACNA HVAC Duct Construction Standards, Figure 5-5, except supporting ductwork with secure wire method is not allowed.

B. Support with 3/32 inch, 7 x 7, stainless steel air-craft cable, with matching serrated spring loaded wedge mechanism fasteners rated for actual load. Steel cable hanging systems will be allowed on round ductwork under 12 inches diameter if installed utilizing two fasteners with two cable loops. Comply with the manufacturer's installation instructions.

3.3 HIGH PRESSURE DUCT (Pressure class 3 inch and over)

A. Seal all duct in accordance with SMACNA seal class "A"; all seams, joints, and penetrations shall be sealed.

3.4 LOW PRESSURE DUCT (Maximum 2 inch pressure class)

A. Seal all duct, with the exception of transfer ducts, in accordance with SMACNA seal class "A"; all seams, joints, and penetrations shall be sealed.

B. Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter dampers, extractors, or grille face dampers will not be accepted for balancing dampers.

C. Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws or pop rivets. Trapeze hangers may be used at contractor's option.

3.5 CLEANING

A. Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the inside of air-handling units before operating fans.

B. Clean duct systems with high power vacuum machines where systems have been used for temporary heat, air-conditioning, or ventilation purposes during construction. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning.

3.6 LEAKAGE TEST

A. Leakage testing will not be required, unless the owner or A/E observes excessive leakage from ductwork, or test and balancing reports indicate duct leakage.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SCOPE

A. This section includes accessories used in the installation of duct systems. Included are the following topics:
   1. Part 1 – General
      a. Related Work
      b. Reference
      c. Reference Standards
      d. Quality Assurance
      e. Shop Drawings
      f. Operation and Maintenance Data
   2. Part 2 – Products
      a. Manual Volume Dampers
      b. Turning Vanes
      c. Fire Dampers
      d. Control Dampers
      e. Smoke Detectors
      f. Access Doors
      g. Flexible Duct
      h. Duct Lining
   3. Part 3 – Execution
      a. Manual Volume Dampers
      b. Turning Vanes
      c. Fire Dampers
      d. Control Dampers
      e. Smoke Detectors
      f. Access Doors
      g. Flexible Duct
      h. Duct Lining

1.2 RELATED WORK

A. Section 23 05 29 – Hanger and Supports for HVAC Piping and Equipment

B. Section 23 31 00 – HVAC Ducts and Casings

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this Section.

1.4 REFERENCE STANDARDS

A. NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems

B. SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition, 1995

C. UL 214

D. UL 555 (6^{th} edition) Standard for Fire Dampers and Ceiling Dampers

E. UL 555S (4^{th} edition) Leakage Rated Dampers for Use in Smoke Control Systems

1.5 QUALITY ASSURANCE

A. Refer to division 1, General Conditions, Equals and Substitutions

1.6 SHOP DRAWINGS

A. Refer to division 1, General Conditions, Submittals.

B. Submit for all accessories and include dimensions, capacities, ratings, installation instructions, and appropriate identification.

C. Include certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance of sound attenuators.

D. Submit manufacturer's color charts where finish color is specified to be selected by the Architect/Engineer.

1.7 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 PRODUCTS

2.1 MANUAL VOLUME DAMPERS

A. Manufacturers: Ruskin, Vent Products, Air Balance, or approved equal.

B. Dampers must be constructed in accordance with SMACNA Fig. 2-12, Fig. 2-13, and notes relating to these figures, except as modified below.

C. Reinforce all blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections with mullions where width is over 48 inches. Use rivets or tack welds to secure individual components; sheet metal screws will not be accepted. Provide operators with locking devices and damper position indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings for all volume damper rods penetrating ductwork constructed to a 3" w.c. pressure class or above.

2.2 TURNING VANES

A. Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley, or approved equal.

B. Construct turning vanes and runners for square elbows in accordance with SMACNA Fig. 2-3 and Fig. 2-4 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one dimension changes in the turn in accordance with SMACNA Fig. 2-5 and Fig. 2-6.

2.3 FIRE DAMPERS

A. Manufacturers: Air Balance, Advanced Air, American Warming and Ventilating, Greenheck, Phillips-Aire, Prefco, Ruskin, Safe-Air or approved equal.

B. Dynamic Fire Dampers
1. Dynamic fire damper assemblies must be UL 555 (6^{th} edition) listed and labeled for dynamic applications (where air systems operate during a fire) and meet requirements of NFPA 90A. Dampers must be type B curtain type with curtain 100% out of air stream. Dampers larger than 30" by 30" or with velocity rating requirements of 3000 fpm or higher, may be multiblade type with blades located in the airstream. Velocity ratings and static pressure ratings as indicated on the drawings. Damper fire rating to be compatible with the rating of the building assembly in which the damper is used.

2.4 CONTROL DAMPERS
A. Control dampers are specified in section 23 09 14.

2.5 SMOKE DETECTORS

A. Smoke detectors are furnished and installed by the Electrical Contractor.

2.6 ACCESS DOORS

A. Access doors to be designed and constructed for the pressure class of the duct in which the door is to be installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be aluminum or steel full length continuous piano type. Doors in concealed spaces shall be secured in place with cam sash latches. For both hinged and non-hinged doors provide sufficient number of camp sash latches to provide air tight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict access. Use minimum 1" deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge galvanized steel frames. For non-galvanized ductwork, use minimum 1" deep double wall access door with frame that shall use materials of construction identical to adjacent ductwork. Provide double neoprene gasket that shall provide seals from the frame to the door and frame to the duct. When access doors are installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.

2.7 FLEXIBLE DUCT

A. Manufacturers: Anco Products, Clevaflex, Thermaflex, Flexmaster or approved equal.

B. Factory fabricated , UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke developed rating of 50 or under in accordance with NFPA 90A.

C. Suitable for pressures and temperatures involved but not less than a 180°F service temperature and ±2 inch pressure class, depending on the application.

D. Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum construction may also be used.

E. Where duct is specified to be insulated, provide a minimum 1 inch fiberglass insulation blanket with maximum thermal conductance of 0.23 K (75 degrees F.) and vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.

2.8 DUCT LINING

A. Manufacturer: Manville, Owens-Corning, Knauf, or approved equal.

B. 1 inch thick, flexible, mat faced insulation made from inorganic glass fibers bonded with a thermosetting resin with thermal conductivity of .25 Btu inch / hour sq.ft. deg F.

C. Meet erosion testing per UL 181 or ASTM C 1071 for 5000 fpm maximum air velocity. ASTM C 411 maximum operating temperature rating of 250 deg F. ASTM E84 flame spread less than 25 and smoke developed less than 50.

D. Meet requirements of ASTM C 1338 and ASTM G21 for fungi resistance.

E. Install liner using adhesive conforming to ASTM C 916.

PART 3 EXECUTION

3.1 MANUAL VOLUME DAMPERS

A. Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter or vibration of the damper blade(s).

3.2 TURNING VANES

A. Install turning vanes in all rectangular, mitered elbows in accordance with SMACNA standards and/or manufacturer's recommendations.

B. Install double wall, airfoil, 2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4-1/2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm or greater.

C. If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct size changes in a radius elbow or if short radius elbows must be used, install sheetmetal turning vanes in accordance with SMACNA Figure 2-5 and Figure 2-6.

3.3 FIRE DAMPERS

A. Install dampers in strict accordance with manufacturer's installation instructions. Install damper sleeves with retaining angles on both sides of rated partition. Connections of ductwork to fire damper assemblies to be as specified on the installation instructions. Where it is necessary to set dampers out from the rated wall, install a sleeve extension encased in two hour rated fire

proofing insulation. Install an access door at each fire damper, located to permit resetting the damper replacing the fusible link.

B. Manually test each fire damper for proper operation by removing the fusible link. Repair or replace any fire damper that does not close completely. Re-install fusible link after test.

3.4 CONTROL DAMPERS

A. Install dampers in locations indicated on the drawings, as detailed, and according to the manufacturer's instructions. Install blank-off plates or transitions where required for proper mixing of airstreams in mixing plenums. Provide adequate operating clearance and access to the operator. Install an access door adjacent to each control damper for inspection and maintenance.

B. All control dampers furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Control Contractor in locations shown on plans or where required to provide specified sequence of control.

C. Damper end switches, where required, shall be independently mounted to the damper drive shaft or auxiliary shaft attached to a damper drive blade. End switches shall be adjusted to prove the damper the position opposite the fail position of the damper actuator unless the control sequence requires a different position to be proven to accomplish the specified control sequence.

D. Coordinate installation with the sheetmetal installer to obtain smooth duct transitions where damper size is different than duct size. Blank off plates will not be accepted.

E. Each operator shall serve a maximum damper area of 36 square feet. Where larger dampers are used, provide multiple operators.

3.5 SMOKE DETECTORS

A. Installation and wiring of detectors will be by the Electrical Contractor. Install an access door at each detector location.

3.6 ACCESS DOORS

A. Install access doors where specified, indicated on the drawings, and in locations where maintenance, service, cleaning or inspection is required. Examples include, but are not limited to motorized dampers, fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, and control devices needing periodic maintenance.

B. Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or other size as indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted coils.

C. Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork directly adjacent to access doors using a minimum of 0.5 inch height lettering reading, “SMOKE DAMPER” or “FIRE DAMPER”. Smoke and combination fire smoke dampers shall also include a second line listing the individual damper tag. The tags must be coordinated with the

mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification are unacceptable. All labels shall be clearly visible from the ceiling access point.

3.7 FLEXIBLE DUCT

A. Flexible duct may only be used for final connections of air inlets and outlets at diffuser, register, and grille locations. Where flexible duct is used, it shall be the minimum length required to make the final connections, but no greater than 5 feet in length, and have no more than one (1) 90 degree bend.

B. Secure inner jacket of flexible duct in place with stainless steel metal band clamp. Secure insulation vapor barrier jacket in place with steel or nylon draw band. Sheetmetal screws and/or duct tape will not be accepted.

C. Flexible duct used to compensate for misalignment of main duct or branch duct will not be accepted.

D. Individual sections of flexible ductwork shall be of one piece construction. Splicing of short sections will not be accepted.

E. Flexible ductwork used as transfer duct shall be sized for a maximum velocity of 300 fpm.

F. Penetration of any partition, wall, or floor with flexible duct will not be accepted.

3.8 DUCT LINING

A. Apply lining to the following ductwork:
   1. All transfer air duct.
   2. All new return air duct.

B. Install liner in compliance with the latest edition of NAIMA's Fibrous Glass Duct Liner Standard. Locate longitudinal joints at the corners of duct only. Cut and fit to assure lapped, compressed joints. Coat all transverse and longitudinal joints and edges with adhesive. Provide metal nosing on leading edge where lined duct is preceded by unlined duct. Adhere liner to duct with full coverage area of adhesive. Additionally secure liner to duct using mechanical fasteners spaced as recommended by the liner manufacturer without compressing liner more than 1/8" with the fasteners.

END OF SECTION

SECTION 23 34 00

HVAC FANS

PART 1 GENERAL

1.1 SCOPE

A. This This section includes specifications for fans that are not an integral part of a manufactured device. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Quality Assurance
      f. Shop Drawings
      g. Operation and Maintenance Data
      h. Design Criteria
   2. Part 2 – Products
      a. General
      b. Ceiling Exhaust Fans
   3. Part 3 – Execution
      a. Installation

1.2 RELATED WORK

A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this Section.

1.4 REFERENCE STANDARDS

A. AMCA 203 AMCA Fan Application Manual – Troubleshooting

B. AMCA 210 Laboratory Method of Testing Fans for Rating

C. AMCA 300 Reverberant Room Method for Sound Testing of Fans

D. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems

1.5 QUALITY ASSURANCE

A. Refer to division 1, General Conditions, Equals and Substitutions.

1.6 SHOP DRAWINGS

A. Refer to division 1, General Conditions, Submittals.

B. Include dimensions, capacities, fan curves, materials of construction, ratings, weights, motors and drives, sound power levels, appropriate identification and vibration isolation for all equipment. Sound power levels to be based on tests performed in accordance with AMCA Standard 300.

C. Submit color selection charts for equipment where applicable.

D. Fan curves shall indicate the relationship of CFM to static or total pressure for various fan speeds. Brake horsepower, recommended selection range, and limits of operation are to also be indicated on the curves. Indicate operating point on the fan curves at design air quantity and indicate the manufacturer's recommended drive loss factor for the specific application. Tabular fan performance data is not acceptable.

1.7 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.8 DESIGN CRITERIA

A. Tested and certify all fans in accordance with the applicable AMCA test code.

B. Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure. The motor furnished with the fan shall not operate into the motor service factor when operating under these conditions.

C. Consider drive efficiency in motor selection according to manufacturer's published recommendation or according to AMCA Publication 203, Appendix L.

D. Where inlet and outlet ductwork at any fan is changed from that shown on the drawings, provide any motor, drive and/or wiring changes required due to increased static pressure or baffling necessary to prevent uneven airflow or improve mixing.

E. All internal insulation and other components exposed to the airstream are to meet the flame spread and smoke ratings contained in NFPA 90A.

PART 2 PRODUCTS

2.1 GENERAL

A. Use fan size, class, type, arrangement, and capacity as scheduled.

B. Furnish complete with motors, wheels, drive assemblies, bearings, vibration isolation devices, and accessories required for specified performance and proper operation. All single phase motors to have inherent thermal overload protection.

C. Statically and dynamically balance all fans so they operate without objectionable noise or vibration.

D. Use AMCA Type A spark resistant construction for all fans handling flammable or explosive vapors.

2.2 CEILING EXHAUST FANS

A. Manufacturers: Carnes, Greenheck, Penn, Jenn-Air, Cook, S&P or approved equal.

B. Centrifugal blower wheel, steel housing with acoustical lining, integral exhaust grille, adjustable mounting brackets to allow for any ceiling thickness, integral junction box with gravity backdraft damper.

C. Provide electronically communicated (ECM) specifically designed for fan application. Motor shall be permanently lubricated, self-aligning ball bearing type. Motor shall be speed controllable down to 20% of full speed.

D. Provide motor mounted dial speed controller for fan speed adjustment.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as shown on the drawings, as detailed, and according to manufacturer's installation instructions. On units provided with a drain connection, reduce drain connection down to ½" fitting and leave open.

B. Install all vibration isolation springs.

END OF SECTION

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 GENERAL

1.1 SCOPE

A. This section includes specifications for air terminal equipment. Included are the following topics:
   1. Part One – General
      a. Scope.
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Quality Assurance
      f. Shop Drawings
      g. Operation and Maintenance Data
      h. Design Criteria
   2. Part 2 - Products
      a. Supply Air Terminal Boxes
      b. Insulation
   3. Part 3 - Execution
      a. Installation
      b. Adjusting

1.2 RELATED WORK

A. Section 23 31 00 - HVAC Ducts and Casings

B. Section 23 33 00 - Air Duct Accessories

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

B. UL 181 - Factory-Made Air Ducts and Connectors.

C. ARI-ADC Standard 880

D. ASTM E84 – Surface Burning Characteristics of Building Materials

E. UL 723 – Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

A. Refer to Division 1, General Conditions, Equals and Substitutions.

1.6 SHOP DRAWINGS

A. Refer to Division 1, General Conditions, Submittals.

B. Contractor shall submit air terminal unit data including materials of construction, dimensions, scheduled flow rates, pressure drops, radiated and discharge sound power levels, reset volume controller data, actuator spring range and torque data.

1.7 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section General Requirements.

1.8 DESIGN CRITERIA

A. Select sizes, capacities, configuration, and operating characteristics as shown on the plans and/or as scheduled.

PART 2 PRODUCTS

2.1 SUPPLY AIR TERMINAL BOXES

A. Units shall be single duct and pressure independent.

B. Manufacturers:
   1. Nailer is the only approved manufacturer.

C. Construction
   1. Unit casing shall be minimum 22 gauge steel and internally insulated with 13/16" rigid fiberglass insulation with a foil scrim face or ¾" thick polyolefin closed cell insulation. Construction to meet UL 181 and NFPA 90A. Casing shall be sealed to limit leakage to a maximum of 15 cfm at 6.0 inches of static pressure. Casing outlet shall have slip and drive joint for connection to discharge ductwork.
   2. Metal damper blade shall be mounted to shaft having self-lubricated bearings. Shaft end shall be marked to indicate damper position and shall have a built-in stop to prevent overstroking. Damper blade shall close off against gasket to limit leakage to 10 cfm at 6.0 inches of differential static pressure. Damper linkage shall be sized to accept at least 40 inch-pounds of torque to the damper shaft. Damper shaft shall be provided with a marking indicating damper position.
   3. Round inlet collar shall be equipped with a multi-point flow sensor that shall amplify the measured velocity pressure. Pneumatic tubing from flow sensor to differential pressure transducer shall be UL listed, fire retardant (FR) type.
   4. Provide factory access door on bottom of units.

D. Hot Water Reheat Coil

1. Construct coils of copper tubes and aluminum fins in a serpentine arrangement with piping connections on the same end. Provide galvanized steel casing, end supports, top and bottom channels to allowance for expansion of finned tube section. Factory test coils at 200 psig.
2. Headers may be cast iron with tubes expanded into the header, steel pipe with tubes brazed to the header, or seamless copper with tubes brazed to the header.
3. Frames to be flanged for a gasketed connection to adjacent ductwork or constructed for slip and drive connection to the ductwork.
4. Minimum reheat coil size is 8 inches x 8 inches.

2.2 ACCESS DOORS

A. Standard Access Doors
1. Access door to be designed and constructed for the pressure class of the duct in which the door is to be installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be steel full length continuous piano type. Doors in concealed spaces may be secured in place with cam sash latches. For both hinged and non hinged doors provide sufficient number of camp sash latches to provide air tight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict access. Use minimum 1" deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge galvanized steel frames. For non-galvanized ductwork, use minimum 1" deep double wall access door with frame that shall use materials of construction identical to adjacent ductwork. Provide double neoprene gasket that shall provide seals from the frame to the door and frame to the duct. When access doors are installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.

B. Round Duct Access Doors:
1. For duct pressure class positive or negative up to 6 in. wg. Access doors shall be constructed from 16 gauge stainless steel for fume exhaust ducts and 16 gauge galvanized steel for general exhaust or return ducts. Hinges shall be continuous piano style constructed from the same material as the access door. Access doors shall be sealed with ¼" closed cell butyl gasketing permanently bonded on all four sides and no fewer than two draw latches with strike plates. The strike plates shall match the duct/access door material.

C. For duct pressure class positive or negative up to 10 in. wg. Access doors shall be the sandwich type and constructed from two layers of stamped 22 gauge stainless steel for fume exhaust ducts and 22 gauge galvanized steel for general or return ducts. Access doors shall be sealed with ¼" butyl gasketing permanently bonded to all four sides of the inside door. The bolts and springs shall be constructed from the same material as the access door. The knobs shall be constructed from polypropylene with threaded metal inserts and able to be fastened without the use of wrenches.

2.3 INSULATION

A. Materials or accessories containing asbestos will not be accepted.

B. Use composite insulation systems (insulation, jackets, sealants, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less.

C. The following two internal insulation options may be utilized.
   1. Rigid Fiberglass Insulation
      a. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.
      b. Foil-scrim-kraft vapor barrier jacket, factory applied to insulation, maximum permeance of .02 perms. All exposed insulation edges shall be covered with metal nosing.
   2. Polyolefin Insulation
      a. Flexible closed cell, minimum nominal density of 1.5 lbs. per cu. ft., thermal conductivity of not more than 0.24 at 75 degrees F, minimum compressive strength of 5 psi at 25% deformation, maximum water vapor permeability of 0.0 perm inch, maximum water absorption of 0% by weight and volume, rated for service range of -165 degrees F to 210 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install air terminal units as indicated on project drawings and in accordance with the manufacturer's installation instructions.

B. Mount air terminal boxes with a minimum 3 feet of straight ductwork upstream of inlet flow sensor for sizes 12" diameter and below. Provide a minimum of 3X the inlet diameter of straight duct upstream of the inlet flow sensor for inlet sizes above 12" diameter.

C. Where hot water reheat coils are provided with air terminal boxes the following two options may be used.
   1. Field mount coil separate from box with a 12-18" section of duct between the air terminal box and reheat coil. The reheat coil and 12-18" section of duct shall be wrapped with external insulation as indicated in specification section 23 07 00 – HVAC Insulation.
   2. Factory mount coil in extended supply air terminal unit. The supply air terminal unit shall be extended at the factory 12-18" and internally insulated to match the insulation used for the supply air terminal unit

D. Provide at least 24" of clearance on controller side of the air terminal unit. The clearance area shall extend the full length of the supply air terminal unit and the full length (including the access door) of the exhaust/return air terminal unit

E. Support air terminal units from building structure using sheet metal straps or trapeze hanger with rods. Do not mount air terminal units off of adjacent ductwork or piping.

F. Refer to Section 23 07 00 for insulation requirements of air terminal reheat coils and piping.

G. Adjust fan speed controller to obtain optimum fan speed for proper terminal unit operation.

H. Electrical Contractor shall provide required line voltage power wiring.

3.2 ACCESS DOORS

A. Duct Access Doors – Square Duct
   1. Provide duct access doors in duct or extended supply air terminal unit upstream and downstream of the reheat coil. Duct access doors shall be as large as duct allows with a maximum size of 18”x18”. Install heating coils in accordance with Section 23 73 12 - Air Handling Unit Coils.

3.3 INSULATION

A. Rigid Fiberglass Insulation
   1. All rigid duct insulation edges shall be covered with metal nosing. Foil scrim face must completely separate the rigid fiberglass duct material from the air stream.

B. Polyolefin Insulation
   1. Apply full cover coat of adhesive to surface to be insulated, insulation and edge butt joints. Place insulation with edge joints firmly butted pressing to surface for full adhesion. Seal seams and joints vapor tight.

C. For supply air terminal units, provide five feet of 1” thick lining immediately downstream from air terminal unit discharge. Where hot water reheat coils are field or factory installed, provide five feet of 1” thick lining in ductwork immediately downstream of reheat coil. Refer to specification section 23 33 00 – Air Duct Accessories for liner specification.

3.4 ADJUSTING

A. Coordinate adjustment of air terminal units with section 23 05 93 - Testing, Adjusting and Balancing.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS & GRILLES

PART 1 GENERAL

1.1 SCOPE

A. This section includes specifications for air terminal equipment. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Reference
      d. Reference Standards
      e. Quality Assurance
      f. Submittals
      g. Design Criteria
   2. Part 2 - Products
      a. Manufacturers
      b. Linear Slot Diffusers
      c. Linear Bar Diffusers and Grilles
      d. Round Ceiling Diffusers
      e. Perforated Ceiling Diffusers
      f. Square Ceiling Diffusers - High Performance
      g. Square Ceiling Diffusers – Plaque
      h. Square Ceiling Diffusers
      i. Plenum Slot Diffusers - 180 Degree Adjustable
      j. Plenum Slot Diffusers – with Gasketed Blade
      k. Security Grille
      l. Side-Wall Registers and Grilles
      m. Eggcrate Grille
      n. Heavy Duty Side-wall Return/Exhaust Grille
      o. Door Grille
      p. Drum Diffuser
      q. Laboratory Supply Diffuser
      r. Perforated Diffuser
      s. Construction Verification Items
   3. Part 3 - Execution
      a. Installation

1.2 RELATED WORK

A. Section 23 31 00 - HVAC Ducts and Casings

B. Section 23 33 00 - Air Duct Accessories

C. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

1.3 REFERENCE

A. Applicable provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

B. UL 181 - Factory-Made Air Ducts and Connectors.

C. ARI-ADC Standard 880

1.5 QUALITY ASSURANCE

A. Refer to division 1, General Conditions, Equals and Substitutions.

1.6 SUBMITTALS

A. Refer to division 1, General Conditions, Submittals.

B. Furnish submittal information including, but not limited to, the following:
   1. Manufacturer's name and model number
   2. Identification as referenced in the documents
   3. Capacities/ratings
   4. Materials of construction
   5. Sound ratings
   6. Dimensions
   7. Finish
   8. Color selection charts where applicable
   9. Manufacturer's installation instructions
   10. All other appropriate data

1.7 DESIGN CRITERIA

A. All performance data shall be based on tests conducted in accordance with Air Diffusion Council (ADC) Test Code 1062 GRD 84.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Carnes, Krueger, Titus, Metal-Aire, and E.H. Price, and United Sheet Metal.

B. Acceptable manufacturers for specific products are listed under each item.

2.2 SQUARE CEILING DIFFUSERS – Plaque

A. Titus model OMNI, Carnes series SFPA/SHPA, Price model SMDP, Metal Aire series 5750, and Krueger series PLQ/5PLQ.

B. Aluminum (Steel) unless otherwise indicated, louvered face furnished with frame type appropriate to installation.

C. Directional blow pattern as shown on the drawings and/or as scheduled.

D. One-piece removable square face plaque with one-piece backpan.

E. White, baked enamel finish or powder coat finish, unless otherwise indicated.

2.3 SIDE-WALL REGISTERS AND GRILLES

A. Titus series 300 (supply) and series 350 (return/exhaust), Carnes model R series, Price model 520 (Supply) or 530 (return/exhaust), Metal Aire series V4000 or H4000, Krueger series 880.

B. Aluminum (Steel) unless otherwise indicated, with frame type appropriate to installation.

C. Double deflection type blade supply registers and supply grilles allow deflection adjustment in all direction.

D. Opposed blade volume control damper supply registers, operable from face.

E. Fixed blade (0 degree, 45 degree) core return and exhaust registers and grilles.

F. Opposed blade volume control damper return registers, operable from face.

G. Register and grille sizes as shown on drawings and/or as scheduled.

H. White, baked enamel finish or powder coat finish, unless otherwise indicated.

I. Screw holes on surface counter sunk to accept recessed type screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install grilles, registers and diffusers as shown on drawings and according to manufacturer's instructions.

B. Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.

C. Seal connections between ductwork drops and diffusers/grilles airtight.

D. Blank off unused portion of linear slot diffusers and linear bar diffusers and grilles.

E. Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct, paint inside of duct with flat black paint to reduce visibility.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes basic electrical requirements, which are applicable to all Division 26 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:
   1. Part 1 – General
      a. Project Overview
      b. Scope
      c. Related Work
      d. Reference Standards
      e. Regulatory Requirements
      f. Quality Assurance
      g. Continuity of Existing Services and Systems
      h. Protection of Finished Surfaces
      i. Approved Electrical Testing Laboratories
      j. Sleeves and Openings
      k. Sealing and Fire Stopping
      l. Intent
      m. Omissions
      n. Submittals
      o. Project/Site Conditions
      p. Work Sequence and Scheduling
      q. Work by Other Trades
      r. Salvage Materials
      s. Certificates and Inspections
      t. Operating and Maintenance Data
      u. Record Drawings
   2. Part 2 – Products
      a. Access Panels and Doors
      b. Identification
      c. Sealing and Fire Stopping
   3. Part 3 – Execution
      a. Paintability
      b. Concrete Work
      c. Cutting and Patching
      d. Building Access
      e. Equipment Access
      f. Coordination
      g. Sleeves and Openings
      h. Sealing and Fire Stopping
      i. Housekeeping and Clean Up
      j. Agency Training

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

1.3 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in this and other sections are as follows:

B. ANSI American National Standards Institute

C. ASTM American Society for Testing and Materials

D. EPA Environmental Protection Agency

E. ETL Electrical Testing Laboratories, Inc.

F. IEEE Institute of Electrical and Electronics Engineers

G. IES Illuminating Engineering Society

H. ISA Instrument Society of America

I. NBS National Bureau of Standards

J. NEC National Electric Code

K. NEMA National Electrical Manufacturers Association

L. NESC National Electrical Safety Code

M. NFPA National Fire Protection Association

N. UL Underwriters Laboratories Inc.

O. DSPS Wisconsin Department of Safety and Professional Services

1.4 REGULATORY REQUIREMENTS

A. All work and materials are to conform in every detail to applicable rules and requirements of the Wisconsin State Electrical Code (SPS 316), the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).

B. All Division 26 work shall be done under the direction of a currently licensed State of Wisconsin Master Electrician.

1.5 QUALITY ASSURANCE

A. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or

accessories into the system and the assigned space, and for obtaining the performance from the system into which these items are placed.

B. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, and approved by City of Madison, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled.

1.6 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

A. No outages shall be permitted on existing systems except at the time and during the interval specified by the user agency and by the City of Madison Project Representative. The institution may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal institutional schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.

B. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that institutional operations are on a seven-day week schedule.

1.7 PROTECTION OF FINISHED SURFACES

A. Furnish one can of touch-up paint for each different color factory finish furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.8 APPROVED ELECTRICAL TESTING LABORATORIES

A. The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:
   1. Underwriters Laboratories Inc.
   2. Electrical Testing Laboratories, Inc.

1.9 SLEEVES AND OPENINGS

A. Refer to Division 1, General Requirements, Sleeves and Openings.

1.10 SEALING AND FIRE STOPPING

A. Sealing and fire stopping of sleeves/openings between conduits, cable trays, wireways, troughs, cablebus, busduct, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

1.11 INTENT

A. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

B. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the City's intent (as determined by the City of Madison Project Manager). Refer to the General Conditions of the Contract for further clarification.

C. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.

D. All sizes as given are minimum except as noted.

E. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the City of Madison's and/or A/E's inspections, tests and approval from the commencement until the acceptance of the completed work.

F. Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

1.12 OMISSIONS

A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the City of Madison to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.13 SUBMITTALS

A. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.

B. On request from the City of Madison, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.

C. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

D. The submittals must be approved before fabrication is authorized.

E. Submit sufficient quantities of submittals to allow the following distribution:
   1. Operating and Maintenance Manuals 2 copies
   2. User agency 1 copy
   3. A/E 1 copy

1.14 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on drawings, unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of City of Madison before proceeding.

C. Tools, materials and equipment shall be confined to areas designated by the City of Madison.

1.15 WORK SEQUENCE AND SCHEDULING

A. Install work in phases to accommodate user agency's occupancy requirements. During the construction period coordinate electrical schedule and operations with City of Madison's Construction Representative.

1.16 WORK BY OTHER TRADES

A. Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.

B. Electrical details on drawings for equipment to be provided by others are based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.

1.17 SALVAGE MATERIALS

A. No materials removed from this project shall be reused unless specifically noted otherwise. All materials removed shall become the property of and shall be disposed of by the Contractor.

1.18 CERTIFICATES AND INSPECTIONS

A. Obtain and pay for all required installation inspections.

1.19 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

C. Manufacturer’s wiring diagrams for electrically powered equipment.

1.20 RECORD DRAWINGS

A. The Contractor shall maintain at least one copy each of the specifications and drawings on the job site at all times.

B. The City of Madison will provide the Contractor with a suitable set of contract drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.

C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.

D. At completion of the project, the Contractor shall submit the marked-up record drawings to the Architect/Engineer prior to final payment.

PART 2 PRODUCTS

2.1 ACCESS PANELS AND DOORS

A. Lay-in Ceilings:
   1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under other divisions are sufficient; no additional access provisions are required unless specifically indicated.

2.2 IDENTIFICATION

A. See Electrical section 26 05 53 – Identification for Electrical Systems.

2.3 SEALING AND FIRE STOPPING AND/OR SMOKE RATED PENETRATIONS:

A. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 “Fire Stopping”.

2.4 NON-RATED PENETRATIONS:

A. Conduit and Cable Tray Penetrations:

B. At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 EXECUTION

3.1 PAINTABILITY

A. Any/all electrical equipment, conduit, wiring, boxes, etc. that is to be exposed shall be painted to match the architectural colors throughout the construction limits. Provide the appropriate finish on all electrical equipment, conduit, wiring, boxes, etc. such that painting is possible. Coordinate all finish requirements with architectural documents.

3.2 CONCRETE WORK

A. The Division 3 Contractor will perform all cast-in-place concrete unless noted otherwise elsewhere. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

3.3 CUTTING AND PATCHING

A. Refer to Division 1, General Requirements, Cutting and Patching.

3.4 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.5 EQUIPMENT ACCESS

A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

3.6 COORDINATION

A. The Contractor shall cooperate with other trades and City of Madison in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the City of Madison, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.

C. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

3.7 SLEEVES AND OPENINGS

A. Conduit penetrations in existing concrete floors: Core drill openings.

B. Where penetrating conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.

3.8 SEALING AND FIRE STOPPING FIRE AND/OR SMOKE RATED PENETRATIONS:

A. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

3.9 NON-RATED PENETRATIONS:

A. At all interior walls and exterior walls, conduit penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the sleeve or cored opening and the conduit is completely blocked.

3.10 PENETRATIONS SUBJECT TO WATER INTRUSION:

A. For penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:
   1. Conduit penetration where steel pipe sleeve is used extend steel sleeve 2" above the floor.
   2. Conduit penetration where cast in place fire stopping device/sleeve is used, extend device/sleeve 2" above the floor (provided it meets the device's UL listing).
   3. Conduit penetration where there is no steel sleeve or cast in place fire stopping device/sleeve, provide 2"x 2" x 1/8" galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8"on center. Seal corners water tight with urethane caulk.

B. Floors subject to water intrusion or rooms housing electrical equipment include the following locations:
   1. Restrooms
   2. Janitor Rooms w/ Sinks
   3. Mechanical/Plumbing Equipment Rooms
   4. Data/Telecommunications Rooms
   5. Electrical Equipment Rooms

C. Provide waterproof caulk sealant top coating on fire stopping system (or other approved means to protect the fire stopping system from water) in areas subject to wash down such as Food Service and Dish Washing Areas.

3.11 HOUSEKEEPING AND CLEAN UP

A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.12 AGENCY TRAINING

A. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 4 hours.

END OF SECTION

SECTION 26 05 02

ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes the demolition associated with the renovation of the Fourth Floor of the City County Building in Madison, Wisconsin. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
   2. Part 2 – Products
      a. Materials and Equipment
   3. Part 3 – Execution
      a. Examination
      b. Preparation
      c. Demolition and Extension of the Existing Electrical Work

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and/or existing record documents. Report discrepancies to the User Agency, Architect/Engineer and City of Madison Field Representative before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with the User Agency, City of Madison Field Representative, and Architect/Engineer. Also, if applicable, coordinate utility service outages with the local 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 and follow the safe working practice requirements of NFPA 70E.

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. Obtain permission from the City of Madison Field Representative at least 48 hours before partially or completely disabling system. Minimize outage duration. If required, 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. Obtain permission from the City of Madison Field Representative and local Authority Having Jurisdiction at least 48 hours before partially or completely disabling system. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area.

F. Existing Communication/Data System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the City of Madison Field Representative and local Telephone Utility. If required, make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations as necessary, to accommodate new construction and to meet all requirements of these specifications. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit and abandoned conduit above accessible ceiling finishes, unless noted otherwise on drawings. Cut conduit flush with walls and floors, and patch surfaces. If certain conduits and boxes are abandoned but not scheduled for removal, they shall be shown on the "As Built Drawings".

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit and wiring servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

G. Provide revised typed circuit directory in panelboards that have circuits removed.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

J. Provide supplemental support for conduits that are routed through demolition area, and are to remain. Supplemental support shall be added so that the conduit meets the support requirements of electrical specification section 26 05 33.

END OF SECTION

SECTION 26 05 04
CLEANING, INSPECTION, AND TESTING OF ELECTRICAL EQUIPMENT

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes the required cleaning, inspection, adjustment, maintenance and testing of electrical equipment, as specified herein. This applies only to new electrical and existing electrical equipment being furnished, modified, worked on or serviced by this contractor for this project. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
   2. Part 2 – Products
      a. Not Used
   3. Part 3 – Execution
      a. General Inspection and Cleaning of All Electrical Equipment
      b. Grounding Systems
      c. Light Fixtures
      d. Occupancy & Vacancy Sensors

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 GENERAL INSPECTION AND CLEANING OF ALL ELECTRICAL EQUIPMENT

A. Inspect for physical damage and abnormal mechanical and electrical conditions.

B. Any item found to be out of tolerance, or in any other way defective as a result of the required inspection or testing, shall be reported to the City of Madison. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.

C. Compare equipment nameplate information with the latest single line diagram and report any discrepancies.

D. Verify proper auxiliary device operation and indicators.

E. Check tightness of accessible bolted electrical joints. Use torque wrench method.

F. Make a close examination of equipment and remove any shipping brackets, insulation, packing, etc. that may not have been removed during original installation.

G. Make a close examination of equipment and remove any dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.

H. Clean All Equipment:
   1. Vacuum inside of panelboards, switchboards, switchgear, transformer core and coils, bus ducts, MCC's, fire alarm panels, communication/data panels, security panels, etc.
   2. Loosen attached particles and vacuum them away.
   3. Wipe all insulators with a clean, dry, lint free rag.
   4. Clean insulator grooves.
   5. Inspect equipment anchorage.
   6. Inspect equipment and bus alignment.
   7. Check all heater elements for operation and control.
   8. Lubricate nonelectrical equipment per manufacturer's recommendations.

3.2 GROUNDING SYSTEMS

A. Inspect the ground system for adequate termination at all devices.

3.3 LIGHT FIXTURES

A. Check the bonding and proper lamping. Verify that recessed fixtures are installed with hold down clips. Confirm operation of the fixture with the proper switch or sensor.

3.4 OCCUPANCY & VACANCY SENSORS

A. Confirm operation of the sensor per the manufacturer’s specification.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes furnishing and installing required wiring and cabling systems including pulling, terminating and splicing. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. References
      d. Submittals
      e. Project Conditions
   2. Part 2 – Products
      a. General
      b. Building Wire
      c. Wiring Connectors
   3. Part 3 – Execution
      a. General Wiring Methods
      b. Wiring Installation in Raceways
      c. Wiring Connections and Terminations
      d. Field Quality Control
      e. Wire Color
      f. Branch Circuits
      g. Emergency Circuits

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

C. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

A. SPS 316- Electrical

1.4 SUBMITTALS

A. Submit product data: Provide for each cable assembly type.

B. Submit factory test reports: Indicate procedures and values obtained.

C. Submit shop drawings for modular wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.

D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required for project conditions.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 PRODUCTS

2.1 GENERAL

A. Materials and equipment for patching and extending work as specified in the individual Sections.

B. All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

C. All conductors shall be copper. All ground conductors shall be copper.

D. Insulation shall have a 600 volt rating.

E. All conductors shall be stranded.
   1. Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved back wired method.

2.2 BUILDING WIRE

A. Description: Single conductor insulated wire 90 degree C.

B. Insulation: Type THHN/THWN-2, XHHW-2 insulation.

2.3 WIRING CONNECTORS

A. Split Bolt Connectors: Not acceptable.

B. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment terminals. Not approved for splicing.

C. Twist Type Wire Connectors: Solderless twist type spring connector (wire-nut) with insulating cover for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller. The

manufacturer's wire fill capacity must be followed. Use Silicone filled twist type spring connectors in all wet location areas.

D. Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.

E. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps. Connector must be installed with a crimper tool listed for use with the manufacturer and type of compression connector.

F. Insulation Piercing Connectors: Molded insulated body, copper teeth, wrench tightened, UL 486B Listed. May be used only for connection of a tap conductor in run and tap type applications when main conductor is 8 AWG and larger.

PART 3 EXECUTION

3.1 GENERAL WIRING METHODS

A. All wire and cable shall be installed in conduit.

B. Do not use wire smaller than 12 AWG for power and lighting circuits.

C. All phase, neutral and ground conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity. As a minimum use 10 AWG conductors for 20 ampere, 120 volt branch circuit home runs longer than 100 feet (30 m), and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet (61 m).

D. Ground conductor size shall be increased per NEC 250.122(B) when phase and phase/neutral conductors are increased in size.

E. Make conductor lengths for parallel conductors equal.

F. Splice only in junction or outlet boxes.

G. No conductor less than 10 AWG shall be installed in exterior underground conduit.

H. Identify ALL low voltage wire, 600V and lower, per section 26 05 53.

I. Neatly train and lace wiring inside boxes, equipment, and panelboards.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use Listed water or silicone based wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary. Wax based lubricants are not allowed. Pulling lubricant is not required for low friction type products where the cable manufacturer recommends that cables be pulled without lube.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Completely and thoroughly swab raceway system before installing conductors.

D. Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway. If parallel phase and/or neutral wires are used, then place an equal number of phase and neutral conductors in same raceway or cable.

E. In high ambient spaces, mechanical rooms, utility rooms and exterior exposed conduit, 90 degree C, XHHW-2 conductors shall be utilized.

3.3 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.

B. Wire splices and taps shall be made firm, and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.

C. All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.

D. Use solderless twist type spring connectors (wire nuts) with insulating covers for wire splices and taps, 10 AWG and smaller.

E. Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of the wiring.

F. Thoroughly clean wires before installing lugs and connectors.

G. At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 26 05 04.

3.5 WIRE COLOR

A. General:
   1. Solid colored insulation is required for all THHN/THWN-2 wire. For other wire types use colored wire or identify wire with colored tape at all terminals, splices and boxes. Wire shall be colored as indicated below.
   2. In existing facilities, use existing color scheme.
   3. Switch legs shall be the same color as their associated circuit, except for the second switch leg used for dual-level switching. The second switch leg shall be the next phase color, e.g. if the first switch leg is brown (277/480V phase A), the second switch leg shall be orange (277/480V phase B).
   4. Traveler conductors run between 3 and 4 way switches shall be colored pink or purple.
   5. Neutral Conductors: White for 120/208V and 120/240V systems, Gray for 277/480V systems. Where there are two or more neutrals in one conduit, each shall be individually identified with a different stripe.

B. Branch Circuit Conductors: Three or four wire home runs shall have each phase uniquely color coded.

C. Feeder Circuit Conductors: Each phase shall be uniquely color coded.

D. Ground Conductors: Green colored insulation for THHN/THWN-2 wire. For other wire types use green colored wire or identify wire with green tape at both ends and at all access points, such as panelboards, motor starters, disconnects and junction boxes. When isolated grounds are required, contractor shall provide green with yellow tracer.

3.6 BRANCH CIRCUITS

A. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All single-phase branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductors.

3.7 EMERGENCY CIRCUITS

A. All Emergency, Legally Required Standby and Optional Standby system wiring shall be installed in separate raceways after their associated transfer switches. The wiring shall be separate from each other and from all normal system wiring.

B. All emergency wiring serving NEC 700 loads, requiring minimum 2 hour fire rating shall comply with NEC 700.10(D)(1).

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes equipment grounding conductors, and bonding for Electrical and Communications systems. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. References
      d. Regulatory Requirements
   2. Part 2 – Products
      a. Mechanical Connectors
      b. Compression Connectors
      c. Conductors
      d. Bus/Busbar
   3. Part 3 – Execution
      a. General
      b. Less Than 600 Volt System Grounding
      c. Communication System Grounding
      d. Field Quality Control
      e. Identification and Labeling
      f. Construction Verification Items
      g. Warranty

B. All hardware, cables and related termination and support hardware shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in this and related sections.

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

1.3 REFERENCES

A. ANSI/IEEE 142 (Latest edition) - Recommended Practice for Grounding of Industrial and Commercial Power Systems

B. UL 467 Electrical Grounding and Bonding Equipment

C. IEEE 837 - IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding

D. TIA-607-C - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 MECHANICAL CONNECTORS

A. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lock washers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.

B. Split bolt connector types are NOT allowed. Exception: the use of split bolts is acceptable for grounding of wire-basket type cable tray, and for cable shields/straps of medium voltage cable.

C. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.2 COMPRESSION CONNECTORS

A. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99% by IACS standards.

B. Each connector shall be factory filled with an oxide-inhibiting compound.

C. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

D. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.

E. The installation of the connectors shall be made with a compression tool and die system, as recommended by the manufacturer of the connectors, and shall be irreversible.

F. Pre-crimping of the ground rod is required for all irreversible compression connections to a ground rod.

G. Terminal lug for communication system grounding shall be compression type and conform to the following:
   1. Material: Tin Plated Copper (aluminum not permitted).
   2. Wire Size: to match conductor
   3. Number of Stud Holes: 2
   4. Stud Hole Size: 3/8”
   5. Bolt Hole Spacing: per TIA-607-C
   6. Tongue Angle: Straight

2.3 CONDUCTORS

A. Material: Stranded copper (aluminum not permitted).

B. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used at the same facility.

C. Branch Circuit Equipment Ground shall be proportionately increased in size when routed with phase conductors increased in size.

D. Conductors for Telecommunications shall be as follows:
   1. Telecommunications Bonding Conductor (TMGB to Service Ground): No. 3/0 minimum or as shown on drawings.
   2. Telecommunications Bonding Backbone (TBB; TMGB to TGB): No. 3/0 minimum or as shown on drawings.
   3. Telecommunications Grounding Equalizer (GE): No. 3/0 minimum or as shown on drawings.
   4. Bonding Conductors shall be insulated with a Green Jacket or jacket marked with Green Tape or labeled per NEC Guidelines.

2.4 BUS/BUSBAR

A. Material: Copper (aluminum not permitted).

B. Size:
   1. All Power systems: 1/4" X 2", length as needed (24” minimum).
   2. Telecommunications Main Ground Busbar (TMGB): 1/4" x 4" x 20" long (minimum).
   3. Telecommunications Grounding Busbar (TGB): 1/4" x 2" x 12" long (minimum).

C. Busbars:
   1. Be pre-drilled to accommodate two-hole lugs.
   2. 3/8” stud hole size; hole spacing per TIA-607-C.
   3. Incorporate insulators and stand-off brackets that electrically isolate busbar from mounting surface.
   4. Provide Telecommunications Grounding Busbar (TGB) in new CC I.T. Room #425 as shown, with Telecommunications Bonding Backbone (TBB) to building TMGB as required.

PART 3 EXECUTION

3.1 GENERAL

A. Install Products in accordance with manufacturer's instructions.

B. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.

C. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.

D. Attach grounds permanently before permanent building service is energized.

E. Terminate each grounding conductor on its own terminal lug. Sharing a single lug by multiple conductors is not allowed.

F. All grounding electrode conductors and individual grounding conductors shall be installed in PVC conduit, in exposed locations.

3.2 LESS THAN 600 VOLT ELECTRICAL SYSTEM GROUNDING

A. Equipment Grounding Conductor: Provide separate, insulated equipment grounding conductor within each raceway. Terminate each end on suitable lug, bus, enclosure or bushing. Provide a ground wire from each device to the respective enclosure.

B. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

3.3 COMMUNICATION SYSTEM GROUNDING

A. Grounding and Bonding System for Communications shall be an isolated grounding system with a single ground point. That ground point is to be the common grounding electrode system at the building electrical service entrance (main ground bar located in electrical room).

B. The system shall be compliant with ANSI J-STD-607-B with the exception that the ground cable shall not be bonded to building steel except at the electrical service entrance.

C. Provide Grounding Busbar for Telecommunications at each Telecommunications Room, the Main Equipment Room and at the electrical service entrance per project drawings. Coordinate Busbar location(s) and conductor routing per drawings with Owner's Division 27 contractor.

D. Provide Telecommunications Bonding Conductor from Telecommunications Main Grounding Busbar (TMGB) at the Communications Entrance Facility to building common grounding electrode system. Attach grounding conductor to building steel as allowed only at the main electrical service entrance. Provide physical protection as required.

E. Provide Telecommunications Bonding Backbone (TBB) conductor from the TMGB to Telecommunications Grounding Busbar (TGB) at each Telecommunication Room, Telecommunications Equipment Room and Telecommunications Enclosure.
   1. TBB shall be continuous and not connected through Telecommunications Grounding Busbars (TGBs).
   2. Bond TGBs to TBB via tap off of TBB. Gauge of conductor to be same at TBB.
   3. Leave 10 feet slack in conductor from TBB to TGB at TGB location(s).
   4. Do not bond TBB or TGB to building steel at TGB location(s).

3.4 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Provide resistance test at each electrical and telecommunications Busbar to ground.

3.5 IDENTIFICATION AND LABELING

A. Label Grounds at point of termination.

3.6 CONSTRUCTION VERIFICATION

A. Record locations of all electrical and telecommunications grounding electrodes, busbars and grounding conductors as installed including recorded ground resistance test results.

3.7 WARRANTY

A. See Division 1, General Conditions, and General Requirements.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The work under this sections includes conduit and equipment supports, straps, clamps, steel channel, etc., and fastening hardware for supporting electrical work. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Submittals
      d. Quality Assurance
   2. Part 2 – Products
      a. Material
   3. Part 3 – Execution
      a. Installation

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 26 05 53 – Identification for Electrical Systems

1.3 SUBMITTALS

A. Product Data: Provide data for support channel.

1.4 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.1 MATERIAL

A. Support Channel
   1. Epoxy Painted:
      a. Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS Grade 33, then painted with water born epoxy applied by a cathodic electro-deposition process.
      b. All fittings and hardware shall be zinc plated in accordance with ASTM B633 (SC3 for fittings, SC1 for threaded hardware).
   2. Hot-dip Galvanized Steel:

a. Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 and shall be hot-dip galvanized after fabrication in accordance with ASTM A123.
b. Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and hot-dip galvanized after fabrication in accordance with ASTM A123.
c. All hardware shall be stainless steel Type 304 or chromium zinc ASTM F1136 Gr. 3.
d. All hot-dip galvanized after fabrication products must be returned to point of manufacture after coating for inspection and removal of all sharp burrs.

3. Stainless Steel:
   a. All strut, fittings and hardware shall be made of AISI Type 304 or Type 316 stainless steel as indicated.

B. Conduit Supports
1. Conduit clamps, straps, supports, etc., shall be steel or malleable iron.
2. One-hole straps shall be heavy duty type. All straps shall have steel or malleable backing plates when rigid steel conduit is installed on the interior or exterior surface of any exterior building wall.
3. Above suspended ceilings, bar joist conduit hangers: Spring Steel Clips with Snap-Close Clamps (Conduit Supports): Conduit clamps shall pivot a full 360 degrees and shall snap close around the conduit. Push-in type conduit clamps are not allowed. Spring clips shall require a hammer to install onto supporting surface.
4. Stud wall applications: Spring Steel Clips with Push-in or Snap-Close Conduit Clamps (Conduit Supports): Conduit clamps shall pivot a full 360 degrees. Spring clips shall require a fastener to install onto stud.
5. Box/conduit hanger with rod/wire clip (a.k.a. antlers): One assembly provides support for electrical box and conduit from drop wire or rod. Conduit clamps shall snap close around the conduit.
6. Spring Steel Clip products shall be provided with corrosion resistance and be warranted against failure from corrosion for a period of ten (10) years from date of manufacture.

C. Threaded Rod: Minimum sized threaded rod for supports shall be 3/8” for trapezes and single conduits 1-1/4” and larger, and ¼” for single conduits 1” and smaller.

D. Hardware: Corrosion resistant, or as noted for each product above.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet-, junction-, and pull-boxes to building structure using pre-cast insert system, preset inserts, beam clamps, or expansion anchors.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs and wood screws in wood construction. If nail-in anchors are used, they must be removable type anchors.

C. Powder-actuated fasteners are not permitted.

D. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit. Do not fasten to suspended ceiling grid system.

E. Do not drill structural steel members unless approved by City of Madison.

F. Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.

G. Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

H. Support Channel
   1. Use one of the following types of support channel as appropriate for the installed environment:
      a. Indoor: Epoxy Painted Steel, Hot-dipped Galvanized Steel, or as noted on the drawings.
      b. Field cuts: File and de-bur cut ends of support channel and paint to prevent rusting. For epoxy-painted support channel, paint cut ends to match the original color. For hot-dipped galvanized support channel, spray cut ends with cold galvanized paint.
   2. Support Wires
      a. Support wires that are installed in addition to the ceiling grid support wires to provide secure support for raceways, cables assemblies, boxes, cabinets, and fittings shall be secured at both ends (e.g. the ceiling structure at the top and the ceiling grid at the bottom) per NEC 300.11(A).
      b. Compressed-air power-actuated fasteners may ONLY be used for the installation of separate ceiling wires required for support of conduits and aircraft cable hung light fixtures.
      c. Support wires shall be identified per specification section 26 05 53.
   3. Spring Steel Clip Conduit Supports
      a. Above suspended ceilings: Spring steel clips with snap-close clamps may be used to support conduit from bar joist (steel truss) systems above suspended ceilings.
      b. Stud wall applications: Spring steel clips with push-in or snap-close conduit clamps may be used to support conduit in interior metal stud wall applications. Use screw fasteners to install conduit clamp onto stud.
      c. Box/conduit hanger with rod/wire clip (a.k.a. antlers): These may only be used in limited applications with the pre-approval of the State of Wisconsin Electrical Inspector.

END OF SECTION

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. This section describes the products and execution requirements relating to furnishing and installing raceways and boxes and related systems as part of a raceway system for electrical, communications, and other low-voltage systems for the project. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. References
      d. Submittals
   2. Part 2 – Products
      a. General
      b. Rigid Metal Conduit (RMC) and Fittings
      c. PVC Coated Rigid Metal Conduit
      d. Intermediate Metal Conduit (IMC) and Fittings
      e. Electrical Metallic Tubing (EMT) and Fittings
      f. Flexible Metal Conduit (FMC) and Fittings
      g. Liquidtight Flexible Metal Conduit (LFMC) and Fittings
      h. Electrical Nonmetallic Tubing (ENT) and Fittings
      i. Rigid Polyvinyl Chloride Conduit (PVC) and Fittings
      j. Fiberglass Resin Conduit (RTRC) and Fittings
      k. High Density Polyethylene Conduit (HDPE) and Fittings
      l. Conduit Supports
      m. Surface Metal Raceway
      n. Surface Nonmetal Raceway
      o. Multi-Outlet Assembly
      p. Auxiliary Gutters (Wireways)
      q. Conduit Water Sealant
      r. Pull and Junction Boxes
      s. In Grade Handholes and Boxes
      t. Outlet Boxes
      u. Outlet Box Extenders
      v. Floor Boxes
      w. Boxes for Audio-Video Equipment
      x. Boxes for Fire Alarm Audio-Visual Notification Appliances
   3. Part 3 – Execution
      a. Conduit Sizing, Arrangement, and Support
      b. Conduit Installation
      c. Conduit Installation Schedule
      d. Surface Metal Raceway and Multi-Outlet Assembly Installation
      e. Coordination of Box Locations
      f. Pull and Junction Box Installation
      g. Outlet Box Installation
      h. Audio-Video System Box and Conduit Installation

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this section.

B. Section 26 05 26 – Grounding and Bonding for Electrical Systems

C. Section 26 05 29 – Hangers and Supports for Electrical Systems

D. Section 26 27 02 – Equipment Wiring Systems

E. Section 26 27 26 – Wiring Devices.

F. Section 28 31 00 – Fire Detection and Alarm

1.3 REFERENCES

A. ANSI/TIA-569-C-Telecommunications Pathways and Spaces

1.4 SUBMITTALS

A. Surface Raceway System - submit product data and catalog sheets for all components.

B. Boxes - provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 PRODUCTS

2.1 GENERAL

A. All steel fittings and conduit bodies shall be galvanized.

B. No cast metal or split-gland type fittings permitted.

C. Mogul-type condulets larger than 2 inch (50 mm) not permitted except as approved or detailed.

D. All condulet covers must be fastened to the condulet body with screws and be of the same manufacture.

E. C-condulets shall not be used in lieu of pull boxes.

F. All boxes shall be of sufficient size to provide free space for all conductors enclosed in the box and shall comply with NEC requirements.

2.2 RIGID METAL CONDUIT (RMC) AND FITTINGS

2.3 Conduit: Heavy wall threaded, galvanized steel, schedule 40.

2.4 Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

2.5 Expansion Fittings/Expansion Joints: Expansion Fittings shall be Internal Grounding type and shall not rely on external bonding jumpers to maintain grounding continuity between raceway components.

2.6 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel, threaded.

B. Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

C. Expansion Fittings/Expansion Joints: Expansion Fittings shall be Internal Grounding type and shall not rely on external bonding jumpers to maintain grounding continuity between raceway components.

2.7 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Conduit: Steel, galvanized tubing.

B. Fittings: All steel, set screw type. No push-on or indenter types permitted.

C. Conduit Bodies: All steel threaded conduit bodies.

2.8 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC) AND FITTINGS

A. Conduit: flexible, steel, galvanized, spiral strip with an outer Liquidtight, nonmetallic, sunlight-resistant jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression type. There shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

2.9 CONDUIT SUPPORTS

A. See section 26 05 29.

2.10 SURFACE METAL RACEWAY

A. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

B. Provide as directed on the plans.

2.11 PULL AND JUNCTION BOXES

A. Interior Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.

B. Interior Sheet Metal Boxes larger than 12 inches (300 mm) in any dimension shall have a hinged cover or a chain installed between box and cover.

C. Boxes 9 square feet and larger shall have hinged covers. Single covers shall not exceed 10 square feet.

D. Interior Sheet Metal Boxes connected to an exterior underground raceway shall have a drain hole located in the bottom of the box.

E. Box extensions and adjacent boxes within 48 inches of each other are not allowed for the purpose of creating more wire capacity.

F. Junction boxes 6 inch-by-6 inch or larger size shall be without stamped knock-outs.

G. Wireways shall not be used in lieu of junction boxes.

2.12 OUTLET BOXES

A. Sheet Metal Outlet Boxes: galvanized steel, with stamped knockouts.

B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 3/8 inch male fixture studs where required.

C. Concrete Ceiling Boxes: Concrete type.

D. Cast Boxes: Cast ferroalloy or aluminum, deep type, gasketed cover, threaded hubs.

2.13 BOXES FOR AUDIO-VIDEO EQUIPMENT

A. Provide floor, wall, and/or ceiling boxes for Audio-Video (AV) Equipment as indicated on the Electrical and/or Audio-Video drawings.

B. FLAT SCREEN MONITOR BOXES
   1. Provide a recessed wall box for mounting behind flat screen monitors, allowing the screens to sit flush against the wall. These boxes shall provide a neat and secure environment for the audio, video, control and power connections.
   2. The recessed wall box shall install easily between any two standard studs in the wall. Connections and cable entry can be on the top or the bottom depending on installation preference.
   3. The recessed wall box shall be provided with one low-voltage conduit entry box and Nationally Recognized Testing Laboratory (NRTL) listed single gang box for AC power.
   4. The recessed wall box cover shall be provided in white or black and shall be suitable for painting. The cover shall have a cable exit slot for the display connections and the excess cable can easily be hidden inside of the box making the entire installation as clean as possible. The cover screws onto the front of the box once all connections are in place.
   5. The recessed wall box shall be designed for new or existing construction. Brackets shall be included for mounting to studs in new construction as well as surface mount clips for mounting to sheet rock or plywood in existing construction.

2.14 BOXES FOR FIRE ALARM AUDIO-VISUAL NOTIFICATION APPLIANCES

A. Recessed boxes for Fire Alarm audio, visual, and audio-visual notification appliances shall be galvanized steel sheet metal with stamped knockouts. Boxes shall be painted red.

B. For surface mounting, use manufacturer supplied back boxes and trim plates, painted red or off white to match device color, and shall contain no visible conduit knock-outs. Mark each device with its circuit number.

PART 3 EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. EMT is permitted to be used in sizes 4 inch (100 mm) and smaller for power and low-voltage systems. See CONDUIT INSTALLATION SCHEDULE below for other limitations for EMT and other types of conduit.

B. Size power conductor raceways for conductor type installed. Conduit size shall be 1/2 inch (16 mm) minimum except all homerun conduits shall be 3/4 inch (21 mm), or as specified elsewhere. Caution: Per the NEC, the allowable conductor ampacity is reduced when more than three current-carrying conductors are installed in a raceway. Contractor must take the NEC ampacity adjustment factors into account when sizing the raceway and wiring system.

C. Size communications and other low-voltage systems raceways as follows:

D. Communications, including Outlet Box: 1-1/4” inch minimum. Conduit used for single device locations (e.g. Wireless Access Point, Video Surveillance Camera, and Wall mounted telephone) may be 3/4 inch minimum.
   1. Control, security, signal, video, and other low-voltage applications: 3/4 inch minimum.
   2. Fire Alarm: 1/2 inch minimum.

E. Provide one raceway from each communications outlet box to above accessible ceiling.

F. Arrange conduit to maintain 6’-8” clear headroom and present a neat appearance.

G. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

H. Maintain minimum 6 inch (150 mm) clearance between conduit and piping. Maintain 12 inch (300 mm) clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

I. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized pipe straps, conduit racks (lay in adjustable hangers), clevis hangers, or bolted split stamped galvanized hangers.

J. Group conduit in parallel runs where practical and use conduit rack (lay in adjustable hangers) constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

K. Do not fasten conduit with wire or perforated pipe straps. Before conductors are pulled, remove all wire used for temporary conduit support during construction.

L. Support and fasten metal conduit at a maximum of 8 feet (2.4 m) on center.

M. Supports shall be independent of the installations of other trades, e.g. ceiling support wires, HVAC pipes, other conduits, etc., unless so approved or detailed.

N. Conceal all conduits except where noted on the drawings or approved by the Architect/Engineer. Contractor shall verify with Architect/Engineer all surface conduit installations except in mechanical rooms.

O. Changes in direction shall be made with symmetrical bends, cast steel boxes, stamped metal boxes or cast steel conduit bodies.

P. For indoor conduits, no continuous conduit run shall exceed 100 feet (30 meters) without a junction box.

Q. All conduits installed in exposed areas shall be installed with a box offset before entering box.

3.2 CONDUIT INSTALLATION

A. Cut conduit square; de-burr cut ends.

B. Conduit shall not be fastened to the corrugated metal roof deck.

C. Bring conduit to the shoulder of fittings and couplings and fasten securely.

D. Use conduit hubs for fastening conduit to cast boxes. Use sealing locknuts or conduit hubs for fastening conduit to sheet metal boxes in damp or wet locations.

E. Threads cut in the field, and factory threads of conduit and nipples not coated with corrosion protection, shall be coated with an approved electrically conductive corrosion compound per NEC 300.6.

F. Corrosion inhibitor, when used in a food service environment, shall be approved for Food Service locations.

G. Terminate all conduit (except for terminations into conduit bodies) using conduit hubs, or connectors with one locknut, or utilize double locknuts (one each side of box wall).

H. Provide bushings for the ends of all conduit not terminated in a box. Refer to Section 26 05 26 – Grounding and Bonding for Electrical Systems for grounding bushing requirements.

I. Provide insulated bushings where raceways contain 4 AWG or larger conductors.

J. Communication and Low Voltage systems conduits shall terminate in horizontal plane.

K. Install no more than the equivalent of:
   1. Three 90 degree bends between boxes for electrical systems.
   2. Two 90 degree bends between boxes for communications and other low voltage systems. Note: Offsets shall be considered 90 degrees.

3. No single bend may exceed 90 degrees.

L. Use hydraulic one shot conduit bender or factory elbows for bends in conduit larger than 2 inch (50 mm) size unless sweep elbows are required.

M. Bend conduit according to manufacturer's recommendations. Torches or open flame shall not be used to aid in bending of PVC conduit.

N. Use suitable conduit caps or other approved seals to protect installed conduit against entrance of dirt and moisture.

O. Provide 1/8 inch (3 mm) nylon pull string in empty conduit, except sleeves and nipples.

P. Install listed expansion deflection fitting or other approved means shall be used where a raceway crosses a structural joint for expansion, contraction or deflection, used in buildings, bridges, parking garages or other structurers.

Q. Route conduit through roof openings for piping and ductwork where possible.

R. Where communication cabling is to be installed in conduit to the wiring hub (e.g. Telecom Room), multiple conduits may be consolidated into fewer, larger conduits. Capacity of shared conduits shall equal the capacity of the individual conduits unless otherwise noted.

S. Use NRTL listed metallic grounding clamps when terminating conduit to cable tray.

T. Ground and bond conduit under provisions of Section 26 05 26.

U. Conduit is not permitted in any slab topping of two inches (50 mm) or less.

V. Identify conduit under provisions of Section 26 05 53.

3.3 CONDUIT INSTALLATION SCHEDULE

A. Conduit other than that specified below for specific applications shall not be used.
   1. Concealed Dry Interior Locations: Rigid Metal conduit, Intermediate Metal conduit, Electrical Metallic Tubing.
   2. Exposed Dry Interior Locations: Rigid Metal conduit, Intermediate Metal conduit, Electrical Metallic Tubing.
   3. Motor and equipment connections: Liquidtight flexible metal conduit (LFMC) (all locations). Minimum length shall be one foot (300 mm); maximum length shall be three feet (900 mm). Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
   4. Light fixtures: Refer to specification section 26 51 13.

3.4 SURFACE METAL RACEWAY AND MULTI OUTLET ASSEMBLY INSTALLATION

A. Use flat head screws to fasten channel to surfaces every twenty-four (24) inches. Mount plumb and level.

B. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

C. Maintain grounding continuity between raceway components to provide a continuous grounding path under provisions of Section 26 05 26.

D. Fastener Option: Use clips and straps suitable for the purpose.

3.5 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough in.

C. No outlet, junction, or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.

D. Conduit and boxes shall not be fastened to the metal roof deck. If conduit and boxes are required to be located and installed on roof decks, the conduit and boxes are required to be spaced minimum 1-5/8 inch off the lowest part of the metal roof decking material, per NEC 300.4 (E).

E. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.

F. In case of any question or argument over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.

G. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

H. Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18 inch (450 mm) by 24 inch (600 mm) access doors. Boxes must be installed within 12” from edge of the access door.

I. Locate and install to maintain headroom and to present a neat appearance.

J. Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.

3.6 PULL AND JUNCTION BOX INSTALLATION

A. Boxes shall be minimum 4 inches square (100 mm) by 2 1/8 inches (54 mm) deep for use with 1 inch (25 mm) conduit and smaller. On conduit systems using 1 1/4 inch (31.75 mm) conduit, minimum box size shall be 4 11/16 inches square by 2 1/8 inches deep.

B. Where used with raceway(s) containing conductors of 4 AWG or larger, box shall be sized as required unless otherwise noted on the drawings.

C. Where used with raceway(s) containing conductors on systems over 600V, size box per NEC 314 Part IV unless otherwise noted as larger on the drawings.

D. Size boxes for communications per ANSI/TIA-568-C.

E. Locate boxes above accessible ceilings, in unfinished areas or furnish and install approved access panels in non-accessible ceilings where boxes are installed. All boxes are to be readily-accessible.

F. Provide boxes for communications and other low voltage applications (a) in any section of conduit longer than 100 feet, (b) where there are bends totaling more than 180 degrees between pull points or pull boxes and (c) wherever there is a reverse bend in run. Locate boxes on straight section of raceway (e.g. do not use boxes in place of raceway bends).

G. Support boxes independent of conduit.

3.7 OUTLET BOX INSTALLATION

A. Do not install boxes back to back in walls. Provide minimum 6 inch (150 mm) separation, except provide minimum 24 inch (600 mm) separation in acoustic rated walls.
   1. Power:
      a. Recessed (1/4 inch maximum) outlet boxes in masonry, concrete, tile construction, or drywall shall be minimum 4 inch square, with device rings. Device covers shall be square-cut except rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes. A single gang box can be used in drywall and masonry, for a single device location, when a single conduit enters box.
      b. Shallow 4 inch square by 1 1/2 inch deep boxes can be used as device boxes for power provided the box and plaster ring is sized for installed device and conductors.
   2. Low Voltage:
      a. Recessed (1/4 inch maximum) outlet boxes in masonry, concrete, tile construction or drywall shall be minimum 4 11/16 inch square by 2 1/8 inch deep with single gang device ring (unless noted otherwise on drawings). Device covers shall be square-cut except rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes.
      b. Provide one conduit from each communications outlet box. Conduit runs between outlet boxes for communications are not allowed. Terminate conduit above accessible ceiling in corridor.

B. Provide knockout closures for unused openings.

C. Support boxes independently of conduit except for cast boxes that are connected to two rigid metal conduits, both supported within 12 inches (300 mm) of box.

D. Use multiple gang boxes where more than one device are mounted together; do not use sectional boxes. Provide non-metallic barriers to separate wiring of different voltage systems.

E. Install boxes in walls without damaging wall insulation.

F. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

G. Ceiling outlets shall be 4 inch square, minimum 2 1/8 inch (54 mm) deep except that concrete boxes and plates will be approved where applicable. Position outlets to locate luminaires as shown on reflected ceiling plans.

H. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches (150 mm) of recessed luminaire, to be accessible through luminaire ceiling opening.

I. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

J. Align wall mounted outlet boxes for switches, thermostats, and similar devices.

K. Provide cast ferroalloy or aluminum outlet boxes in exterior and wet locations.

L. Surface wall outlets shall be 4 inch (100 mm) square with raised covers for one and two gang requirements. For three gang or larger requirements, use gang boxes with non-overlapping covers.

3.8 AUDIO-VIDEO SYSTEM BOX AND CONDUIT INSTALLATION

A. Conduit requirements for AV systems cabling may differ from those of other trades. It is important that the electrical contractor become familiar with these specialized requirements. AV systems cabling must be enclosed within continuously grounded ferrous metallic conduit or raceway. PVC conduit is not acceptable. Conduit and raceway is to be furnished and installed by electrical contractor. Conduits containing different wiring classes must maintain minimum separations to minimize interferences from electrical noise. Conduits sizes and quantities shown on bid documents are minimums. Separate conduit runs specified in bid documents may not be combined for any purpose.

B. Provide AV boxes as shown on the Electrical and/or Audio-Video drawings. Install boxes at heights and locations as indicated on the drawings. Coordinate all box installations with the AV equipment provider.

C. Flat screen monitor boxes shall be installed so that all cabling is concealed behind the monitor. Coordinate box location with flat screen mounting brackets so that the box cover and cables are not blocked by the brackets.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes the products and execution requirements relating to labeling of power, control, signaling and fire alarm wiring. Further, this section includes the installation of labels, nameplates, and directories for electrical boxes, wiring devices, and equipment. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Submittals
   2. Part 2 – Products
      a. Materials
   3. Part 3 – Execution
      a. General
      b. Box Identification
      c. Communication Conduit Labeling
      d. Power, Control and Signal Wire Identification
      e. Wiring Device Identification
      f. Support Wire Identification
      g. Nameplate Engraving for Electrical Equipment
      h. Panelboard Directories

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this section.

B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

C. Section 26 05 23 – Control-Voltage Electrical Power Cables

1.3 SUBMITTALS

A. Include schedule for nameplates.

B. Prior to installation, the Contractor shall provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used. Samples shall be mounted on 8 1/2" x 11" sheets annotated, explaining their purposed use.

PART 2 PRODUCTS

2.1 MATERIALS

A. Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE ALLOWED.

B. Wire Labels: All wiring labels shall be white/transparent vinyl or vinyl-cloth, self-laminating, wraparound type. Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.

C. Tape (wiring phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

D. Nameplates: Engraved three layer laminated plastic. Normal system shall use nameplates with black letters on white background, emergency system (NEC 700) shall use white letters on red background.

E. See Box Identification and Wiring Device Identification sections for allowed usage of permanent marker.

PART 3 EXECUTION

3.1 GENERAL

A. Where mixed voltages are used in one building (e.g. 4160 volt, 480 volt, 208 volt) each switch, switchboard, junction and pull box, equipment, etc., on each system shall be labeled for voltage in addition to other requirements listed herein.

B. All branch circuit and power panels shall be identified with the same symbol used in circuit directory in main distribution center.

C. Clean all surfaces before attaching labels with the label manufacturer's recommended cleaning agent. Install all labels firmly as recommended by the label manufacturer. Labels shall be installed plumb and neatly on all equipment.

D. Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using screws, rivets or manufacturer approved adhesive or cement.

E. Embossed tape shall not be permitted for any application.

3.2 BOX IDENTIFICATION

A. The following junction and pull boxes shall be identified utilizing spray painted covers:

System	Color(s)
SECONDARY POWER – 208Y/120V, 240/120V	WHITE
Emergency System (NEC 700) – 208Y/120V	White/Red
Fire Alarm (see below)	Red
Temperature Control	Green
Door Access Control	Orange
Communications	Blue

B. All boxes with power wiring shall be further identified with circuit numbers and source panel designation as follows:
   1. All outlet and device boxes shall use machine-generated adhesive labels, or neatly hand-written permanent marker.

2. All exposed junction and pull boxes larger than 8" square shall utilize engraved nameplates with ½" minimum letter height. All exposed junction and pull boxes 8" square or smaller shall utilize machine-generated adhesive labels.
3. All junction and pull boxes located above an accessible ceiling shall utilize machine-generated adhesive labels, or neatly hand-written permanent marker.

C. All fire alarm boxes (covers and outer sides) shall be painted red and labeled "Fire Alarm" or "FA". When red conduit is used for the alarm system installation, there is no need to paint the box sides, - paint the covers only. Non-factory device boxes shall also be painted red.

D. Other system boxes shall be further identified as shown on drawing details or approved shop drawings.

3.3 COMMUNICATIONS CONDUIT LABELING

A. Provide label on all conduits installed between Telecommunication Equipment Rooms. Both ends of the conduits shall be labeled. All labels shall be mechanical, no hand-written labels.

B. The label shall indicate the location of the far end of the conduit run and a unique conduit number. (i.e. TR-1A-01 or Room #216 – 01). Refer to agency standards where applicable.

3.4 POWER, CONTROL AND SIGNALING WIRE IDENTIFICATION

A. Provide wire labels on each conductor in panelboard gutters, all boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control and signaling wires.

B. All wiring shall be labeled within 2 to 4 inches of terminations. Each end of a wire or cable shall be labeled as soon as it is terminated, including wiring used for temporary purposes.

3.5 WIRING DEVICE IDENTIFICATION

A. Wall switches, receptacles, occupancy sensors, photocells, poke-through fittings, access floor boxes, and time clocks shall be identified with circuit numbers and source (ex. Panel ABC-3). In exposed areas, identifications should be made inside of device covers, unless directed otherwise. Use machine-generated adhesive labels, or neatly hand-written permanent marker.

3.6 SUPPORT WIRE IDENTIFICATION

A. Support wires that are installed in addition to the ceiling grid support wires to provide secure support for raceways, cables assemblies, boxes, cabinets, and fittings shall be distinguishable from the ceiling grid support wires per NEC 300.11(A). This identification shall be either approximately 6 inches of fluorescent orange paint, or orange tape flags 3/4 inches high-by-2 inches wide (minimum) within 12 inches of the bottom of the support wires.

3.7 NAMEPLATE ENGRAVING FOR ELECTRICAL EQUIPMENT

A. Provide nameplates of minimum letter height as scheduled below.

B. Individual Circuit Breakers, Disconnect Switches, Enclosed Switches, and Motor Starters: ½ inch (13 mm); identify source and load served.

3.8 PANELBOARD DIRECTORIES

A. Update existing directories with typed directories.

END OF SECTION

SECTION 26 27 02
EQUIPMENT WIRING SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes electrical connections to equipment specified under other Divisions and/or Sections, or furnished by Owner, including, but not limited to:
   1. Misc. Equipment
   2. HVAC and Plumbing motors, VFDs, and panels
   3. Elevators
   4. Coolers & Freezers
   5. Kitchen, Dishwashing and Laundry Equipment

B. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Submittals
      d. Coordination
   2. Part 2 – Products
      a. Cords and Caps
      b. Other Products
   3. Part 3 – Execution
      a. Inspection
      b. Preparation
      c. Installation
      d. Miscellaneous Connections
      e. HVAC and Plumbing Connections
      f. Kitchen, Dishwashing and Laundry Equipment Connections
      g. Equipment Connection Schedule

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

C. Section 26 05 33 – Raceway and Boxes for Electrical Systems

1.3 SUBMITTALS

A. Product Data: Provide data for cord and wiring devices.

1.4 COORDINATION

A. Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.

PART 2 PRODUCTS

2.1 CORDS AND CAPS

A. Straight blade Attachment Plug: NEMA WD 1.

B. Locking blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil resistant thermoset insulated multi-conductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

2.2 OTHER PRODUCTS

A. Refer to related sections for other product requirements.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energizing.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

B. Provide a green equipment ground conductor for all installed equipment wiring.

C. Make conduit connections to equipment using flexible PVC-coated metal conduit.

D. Install pre finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain relief clamps.

E. Provide suitable strain relief clamps for cord connections to outlet boxes and equipment connection boxes.

F. Make wiring connections in control panel or in wiring compartment of pre wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

G. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

3.4 MISCELLANEOUS CONNECTIONS

A. Hand Dryers: Provide handle lock on source circuit breaker to serve as required lock open disconnect.

B. Drinking Fountains and Bottle Fill Fountains: Provide GFCI source circuit breaker to serve receptacle at fountain.

3.5 HVAC AND PLUMBING CONNECTIONS

A. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.

B. Contractor shall verify with mechanical contractor the electrical requirements including voltages, horsepower, disconnecting means, starters and variable frequency drives for motors and equipment prior to ordering circuit breakers, disconnects and starters.

C. Provide 120 volts to each temperature control panel. Coordinate quantity and exact locations with HVAC/DDC contractors.

D. Unless otherwise specified, all electrical control devices such as aqua-stats, float and pressure switches, fan powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired by the Contractor supplying the devices.

E. Provide 120V, single phase 15 ampere circuit and switching means to serve factory installed interior lighting within each HVAC unit.

F. Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

G. Check for proper rotation of each motor.

3.6 KITCHEN, DISHWASHING AND LAUNDRY EQUIPMENT CONNECTIONS

A. Check loose equipment delivered to job by equipment installer against approved shop drawings or other required Drawings. Loose electrical equipment including disconnects, starters, thermostats, controls, local and remote switches furnished by equipment contractor shall be installed by electrical contractor.

B. Review dimensioned equipment layouts, detailed shop drawings of equipment, wiring, control and final connection diagrams available from the equipment supplier.

C. Provide non-fused disconnect switches serving equipment. Equipment installed in damp or wet locations shall be provided with NEMA 4X enclosures.

D. Provide Rigid Metal Conduit (RMC) or Intermediate Metal Conduit (IMC) for all surface conduit and fittings in these spaces.

E. Equipment contractor will receive all equipment and position in place.

F. Electrical Contractor shall rough in for equipment only from approved equipment shop drawings.

G. Rough in location shall be within three inches of equipment. If direct connection is required, use liquid-tight flexible conduit. If receptacle connection is required, verify proper receptacle configuration with equipment installer.

H. Final connections shall include extension of all service to each piece of equipment. All labor and material required to completely connect the equipment ready to operate shall be included in the final connections. All control wiring not integral with equipment shall be included.

I. Provide all required power and control wiring. This may include (but is not limited to) the following:
   1. Provide pushbutton switch or manual starter for exhaust fan.
      a. Provide emergency branch circuit for fire suppression system (if applicable). Wire automatic heat detectors or manual station so, when activated, valve of dry chemical bottle opens, gas solenoid valve shuts down, all dampers close, and make-up fans shut down, electrical power contactor opens (integral in equipment), and building fire alarm system is activated. Provide all required wiring, conduit and final connections. Refer to wiring diagrams supplied with equipment.
      b. Provide wash-down system wiring; refer to schematic wiring diagrams supplied with hoods. Interconnect fire prevention system with wash-down system so wash-down system is activated upon alarm.

3.7 EQUIPMENT CONNECTION SCHEDULE

A. As indicated on the drawings.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.1 SCOPE

A. This section describes the products and execution requirements relating to furnishing and installing wiring devices and related systems for the project. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Submittals
      d. Operation and Maintenance Data
   2. Part 2 – Products
      a. Modularly Connected (Modular) Devices
      b. Wall Switches
      c. Receptacles
      d. Occupancy & Vacancy Sensors
      e. Emergency Lighting Control Units
      f. Wall Dimmers
      g. Device Plates and Box Covers
   3. Part 3 – Execution
      a. Installation
      b. Field Quality Control
      c. Occupancy & Vacancy Sensors
      d. Adjusting

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this section.

1.3 SUBMITTALS

A. Provide product data showing model numbers, configurations, finishes, dimensions, and manufacturer's instructions.

B. For occupancy sensor shop drawings, the manufacturer’s actual layout of occupancy sensors and the wiring diagrams shall be provided.

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 PRODUCTS

2.1 MODULARLY CONNECTED (MODULAR) DEVICES:

A. Modularly connected devices are allowed, but not required.

B. Modular Pigtailed Connector: Polarized connector with minimum six-inch stranded copper wire leads, polycarbonate right-angle housing, UL498 listed, with finger-safe connector housing which provides insulation from conductive surfaces. Contacts shall be brass. Connector shall be manufactured so that it provides a secure connection such that it will maintain contact with the device until the device is removed for replacement. Modular connectors shall be provided with covers which protect the contacts from paint, drywall mud, and construction dust and debris. Connectors shall be Hubbell SNAPConnect, Leviton Lev-Lok, Pass & Seymour PlugTail, or approved equal.

2.2 WALL SWITCHES

A. General: Heavy duty use toggle switch, rated 20 amperes and 120 volts AC. Switches shall be UL20 Listed and meet Federal Specification WS-896. All switches shall be heavy duty Specification Grade.

B. Handle: Ivory made of nylon or high impact resistant material. Refer to plans for specific areas where brown or black devices/plates are required.

C. All switches on emergency circuits shall have a red handle with matching red cover plate.

D. Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: All switches shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG, with separate green ground screw. Switches shall be as follows:
   1. Hubbell 1221*,
   2. Leviton 1221-S*,
   3. Pass & Seymour CSB20AC1-*, or approved equal. (* indicates color selection).

E. Modular Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: Switches shall be as follows:
   1. Hubbell SNAP1221*NA,
   2. Leviton M1221-*,
   3. Pass & Seymour PT20AC1-*, or approved equal. (* indicates color selection).

2.3 RECEPTACLES

A. General Requirements: NEMA Type 5 20R, ivory nylon or high impact resistant face. Receptacles shall be UL498 Listed and meet Federal Specification WC-596. All duplex receptacles shall be heavy duty Specification Grade, 20 amp rated. Refer to plans for specific areas where brown or black devices/plates are required.

B. Generally, all receptacles shall be duplex convenience type unless otherwise noted.

C. All receptacles on emergency circuits shall have a red face with matching red cover plate.

D. All receptacles installed in bathrooms, kitchens, and within 6 feet of the outside edge of sinks shall be GFCI type.

E. All receptacles installed in outdoor locations, garages, rooftops, and in other damp or wet locations shall be GFCI type with a weather-resistant (WR) rating.

F. Convenience and Straight blade Receptacles: All receptacles shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG, with a separate green ground screw. Receptacles shall be as follows:
   1. Hubbell 5362*,
   2. Leviton 5362-*,
   3. Pass & Seymour PS5362*, or approved equal. (* indicates color selection).

G. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter meeting the requirements of UL standard 943 Class A, including self-test functionality and reverse line-load misfire function repeatability. GFCI receptacles shall be as follows:
   1. Hubbell GFR5362SG*,
   2. Leviton GFNT2-*,
   3. Pass & Seymour 2097*, or approved equal. (* indicates color selection).

H. GFCI Receptacles with a weather-resistant (WR) rating: Weather-Resistant duplex convenience receptacle with integral ground fault current interrupter meeting the requirements of UL standard 943 Class-A, including self-test functionality and reverse line-load misfire function repeatability. WR GFCI receptacles shall be as follows:
   1. Hubbell GFR5362SG*,
   2. Leviton GFWR2-*,
   3. Pass & Seymour 2097TRWR*, or approved equal. (* indicates color selection).

I. USB Charger Receptacles: Do not use combination duplex receptacles with USB chargers. Use duplex receptacles as required for the application and as specified herein. Use separate 4-port USB charging devices.

J. USB Charging Devices: Single-gang 4-port USB charging station. USB ports shall meet UL94 for 5V flammability rating, and shall comply with battery charging specification USB BC1.2. USB ports shall be compatible with USB 1.1/2.0/3.0 devices, including Apple products. USB ports shall be rated 5VDC, 4.2A minimum. Devices shall be as follows:
   1. Hubbell USB4*,
   2. Leviton USB4P-*,
   3. Pass & Seymour TM8USB4*CC6, or approved equal. (* indicates color selection).

K. Locking Blade Receptacles: As indicated on drawings.

L. Specific use Receptacle Configuration: As indicated on drawings.

M. Modular Convenience and Straight blade Receptacles: Receptacles shall be as follows:
   1. Hubbell SNAP5362*A,
   2. Leviton M5362-*,
   3. Pass & Seymour PT5362*, or approved equal. (* indicates color selection).

N. Modular GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter meeting the requirements of UL standard 943 Class A, including self-test functionality and reverse line-load misfire function repeatability. GFCI receptacles shall be as follows:
   1. Hubbell GFRST83SNAP*,
   2. Leviton MGFN2-*,
   3. Pass & Seymour PT2097*, or approved equal. (* indicates color selection).

O. Modular GFCI Receptacles with a weather-resistant (WR) rating: Use back and side wired devices in lieu of modular weather-resistant rated GFCI receptacles.

2.4 OCCUPANCY & VACANCY SENSORS

A. General Requirements: All occupancy sensors shall be hardwired type; battery type shall not be permitted.
   1. Sensors shall use either passive infrared, or if dual technology, passive infrared and passive acoustic sensing or passive infrared and ultrasonic sensing for detecting room occupancy.
   2. Sensitivity shall be user adjustable or self-adjusting type.
   3. The delay timer shall be adjusted within a range of 6 to 30 minutes by the contractor in the field. The sensor shall have a test mode for performance testing.
   4. The test LED shall indicate motion.
   5. Line voltage sensors are acceptable, especially in exposed ceiling areas where all wiring shall be installed in conduit, including low voltage cabling if power packs are used. Provide power pack as required for low voltage sensors.
   6. See drawings for actual types of sensors.
   7. Occupancy sensors and power packs shall have five year warranties.

B. Wall Mounted (Wall Switch Type): The unit shall fit in/on a standard single gang switch box.
   1. Rated capacity: 600 watts minimum at 120 volts, 60 Hz.
   2. The sensor shall have two switches where dual-level lighting is required. The switch shall have manual override for positive OFF and automatic ON.
   3. The area of coverage shall be approximately 180 degrees by 35-40 feet.
   4. The device shall be programmed for vacancy (manual-on) control.

C. Ceiling Mounted: The unit shall fit in/on a standard octagon box. All ceiling mounted sensors shall be installed to a box with ring and box support.
   1. The coverage area shall be 360 degrees by approximately 15 feet radius when mounted at 9 foot height. The sensor shall have provisions, such as masking, to block out problem areas.

D. Ceiling/Corner Mounted: The unit shall fit in/on a standard octagon box. All ceiling mounted sensors shall be installed to a box with ring and box support.
   1. The coverage area shall be 90 degrees or greater by approximately 40 feet radius when mounted at 9 foot height. The sensor shall have provisions, such as masking, to block out problem areas.

E. Power Packs: Provide power packs as required for low voltage sensors. Rated capacity shall be 20 amps at 120 volts.
   1. The unit shall fit on a standard octagon box. All power packs shall be installed onto a supported box.

2. Low voltage cabling shall be plenum rated or installed in conduit in plenum-rated areas.

F. Auxiliary Contacts for HVAC Interlock: Provide auxiliary dry contacts for HVAC BAS interlock when required. Refer to the "Occ Sensor Interlock" column in the Air Terminal Schedule(s) on the HVAC drawings. When required, provide auxiliary contacts regardless if the occupancy sensors are line or low voltage.
   1. The occupancy sensors and auxiliary contacts shall be wired such that the sensor still detects occupancy and controls the auxiliary contacts regardless if the light switch(es) are in the OFF position (e.g. the occupant has turned the lights OFF because there is enough daylight, but the occupant is still occupying the space, and the occupancy sensor senses the occupant and closes the auxiliary contacts for BAS input).
   2. The BAS wiring to the auxiliary contacts shall be by the Division 23 contractor.

2.5 EMERGENCY LIGHTING CONTROL UNITS

A. General Requirements: The Emergency Lighting Control Unit (ELCU) shall automatically illuminate connected emergency lighting upon utility power interruption, regardless of room switch position or occupancy sensor state.
   1. The ELCU shall be UL 924 listed.
   2. Warranty shall be 5 year replacement warranty.
   3. Local room switch or lighting control shall turn both normal and emergency luminaires ON at the same time (no dedicated emergency room switch required).
   4. The ELCU shall have a minimum load rating of 20 Amps at 120V, 1800W Tungsten at 120V,
   5. 1 HP, or general use 20 Amp circuits.
   6. The ELCU shall accept 120V, 60Hz Input & Output (voltage tolerance +/- 15%).
   7. The ELCU shall include emergency power and normal power indicator LEDs, and a manual test switch.
   8. The ELCU shall accept separate phases on the constant hot and switched hot inputs.
   9. The ELCU shall include high voltage input surge protection up to 50,000V.
   10. Load contacts shall be able to withstand 10 direct shorts while connected to a 20 Amp breaker without permanent damage.
   11. The ELCU shall not generate any objectionable electrical or mechanical noise.
   12. The ELCU shall have UL 94-VO or UL 94-5VA flame rating and be approved for installation above the suspended ceiling.

B. Dimming Applications: The ELCU shall automatically illuminate connected emergency lighting to full brightness upon utility power interruption, regardless of dimmer or switch position or occupancy sensor state.
   1. The ELCU shall be compatible with 2-wire, 3-wire, 0-10V, and DALI dimming systems and ballasts.
   2. The same local room switch, dimmer, or lighting control shall dim both normal and emergency luminaires at the same level during normal operation.

2.6 WALL DIMMERS

A. General:
   1. Compatible with the voltage of the circuit being controlled: 120V;
   2. Compatible with the load being dimmed;
   3. Linear full-range slide control;

4. Separate ON/OFF switch: single-pole, 3-way, or multiple-location operation as indicated on the drawings;
5. No derating required in multi-gang applications;
6. Polycarbonate construction;
7. Color to match receptacles and/or standard toggle switches.

B. Line-voltage LED Dimmer:
1. Forward or reverse phase dimming control as required for the application;

C. 0-10 V Dimmers:
1. Ratings: 30 mA sink current;
2. Adjustable dial allows users to trim the low-end dimming range;

2.7 DEVICE PLATES AND BOX COVERS

A. Decorative Cover Plate: Ivory smooth thermoplastic nylon. Note requirement for red plates on emergency outlets and switches. Refer to plans for specific areas where brown or black devices/plates are required.

B. Weatherproof Cover: All receptacles installed in wet locations shall have an enclosure that is weatherproof whether or not the attachment plug is inserted. Covers shall be gasketed metal with hinged "in-use" device covers, powder coat painted. Non-metallic covers are not allowed. Covers shall be latching type and shall be lockable. Covers shall be identified as "extra-duty" type per NEC 406.9(B)(1).

C. Damp Location Cover: All receptacles installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure that is weatherproof when the receptacle is covered (attachment plug not inserted and receptacle covers closed). Covers shall be gasketed metal with hinged device covers, powder coat painted. Non-metallic covers are not allowed.

D. Surface Cover Plate: Raised galvanized steel.

PART 3 EXECUTION

3.1 INSTALLATION

A. See plans for device mounting heights.

B. Install wall switches with OFF position down.

C. Wall dimmers: de-rate ganged dimmers as instructed by manufacturer; do not use common neutral.

D. Install convenience receptacles with grounding pole on bottom.

E. Install box for information outlet at the same height as adjacent convenience receptacles. Locate boxes for information outlet as close as practical to duplex power outlet, approximately 2-inches apart.

F. Install box for telephone jack for wall telephone at 46-inches to center above finished floor.

G. Install specific use receptacles at heights shown on Contract Drawings.

H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

J. Install devices and wall plates flush and level.

K. Receptacles shall have a bonding conductor from grounding terminal to the metal conduit system. Self-grounding receptacles using mounting screws as bonding means are not approved.

3.2 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch and sensor with circuit energized, and verify proper operation.

C. Verify operation of each ELCU by turning off the normal power circuit breaker at the panelboard.

D. Verify that each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

G. The City of Madison personnel reserve the right to be present at all tests.

3.3 OCCUPANCY & VACANCY SENSORS

A. Power packs used in return air plenum ceiling areas shall be installed in an approved enclosure or UL listed for return air plenum.

B. Provide a minimum of 4’ of coiled cable for ceiling-mounted sensors.

C. Occupancy sensors shall be installed at locations indicated on the manufacturer’s submittal layout drawings. Sensors shall be located to prevent false “ON” tripping of the lights.

D. Sensitivity Test: After the sensor has been energized for at least 15 minutes, walk to the middle of the room (if conference room) or sit at the normal desk position (if an office). Make no motion for 20 seconds. Move one arm up and down slowly. The test LED should blink.

E. Time Delay Test: Set the time delay for 10 minutes. Walk into the room to activate the sensor then leave room. Sensor must turn lights off at approximately 10 minutes. Walk into the room again to reactivate the lights. Lights should activate within 1 second.

F. For lights on emergency power without an emergency lighting control unit (ELCU), use the emergency circuit to energize the occupancy sensor’s power pack. Route the emergency circuit through the occupancy sensor’s power pack relay to the light fixtures. Route any non-

emergency circuits controlled by the same occupancy sensor through separate auxiliary relay packs.

G. For lights on emergency power with an ELCU, route the normal power through the switches and occupancy sensor relay to the ELCU, then to the normal power lighting fixtures. Connect the emergency circuit to the ELCU's emergency power terminals, then to the emergency lighting fixtures. The ELCU will control the emergency lighting along with the normal lighting controls, but will turn the emergency lights ON in a power outage, regardless of the position of the switches or relays.

3.4 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Mark all conductors with the panel and circuit number serving the device with a machine generated label, at the device, and on the back of the device cover.

END OF SECTION

SECTION 26 27 28
DISCONNECT SWITCHES

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes disconnect switches, fuses and enclosures. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. References
      d. Submittals
      e. Operation and Maintenance Data
      f. General
   2. Part 2 – Products
      a. Disconnect Switches
      b. Fuses
   3. Part 3 – Execution
      a. Installation
      b.

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this section.

B. Section 26 27 02 - Equipment Wiring Systems

1.3 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation"

B. NEMA ICS 2 – Industrial Control Devices, Controllers, and Assemblies

C. NEMA KS 1 – Enclosed Switches

D. UL 50 – Enclosures for Electrical Equipment

E. UL 98 – Enclosed and Dead-front Switches

1.4 SUBMITTALS

A. Include outline drawings with dimensions, and equipment ratings for voltage, ampacity, horsepower, and short circuit.

1.5 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.6 GENERAL

A. Provide disconnect switches for loads required by code. Review HVAC and Plumbing specifications to determine what equipment is furnished with disconnect switches. Install disconnect switches whether furnished under this contract or not. It is the Electrical Contractors responsibility to determine the need for a disconnect switch for each load. The contractors shall include in their bid the code required disconnect switches whether indicated on the drawings or not.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

A. Fusible Switch Assemblies (use only when overcurrent protection is required): NEMA Type Heavy Duty; quick make, quick break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: designed to accommodate Class R, Class J or Class CC (motors) cartridge type fuses.

B. Nonfusible Switch Assemblies: NEMA Type Heavy Duty; quick make, quick break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosure:
   1. Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.
   2. Outdoors: NEMA 3R code gauge zinc coated steel with baked enamel finish or NEMA 4 when indicated on drawings.

D. Provide manufacturer's equipment ground kit in all disconnect switches.

E. In applications where the switch serves as the service entrance disconnect, provide service ground kit, label as service disconnect and provide UL listing for service disconnect.

2.2 FUSES

A. Fuses 600 Amperes and Less: Dual element, time delay, 600 volt, UL Class RK 5. Interrupting Rating: 200,000 rms amperes.

B. Fuses 30 Amperes and less: Time-Delay, 600 volt, UL Class CC. Interrupting rating: 200,000 rms amperes.

C. Provide three (3) spares of each size and type fuse.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings or required by NEC.

B. Provide identification as specified in Section 26 05 53.

C. Provide label on inside of disconnect cover identifying the type and size of fuse to be utilized.

END OF SECTION

SECTION 26 51 13
INTERIOR LIGHTING FIXTURES

PART 1 GENERAL

1.1 SCOPE

A. This section describes the products and execution requirements relating to furnishing and installing wiring devices and related systems for the project. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Submittals
      d. Operation and Maintenance Data
      e. Extra Materials
      f. Definitions
   2. Part 2 – Products
      a. Interior Luminaires and Accessories
      b. LED Luminaires
      c. LED Drivers
   3. Part 3 – Execution
      a. Installation
      b. Adjusting and Cleaning
      c. Interface with Other Products
      d. Zero-to-10V Dimming Control Wiring Installation
      e. Field Quality Control
      f. Luminaire Connections

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this section.

B. Section 26 27 26 – Wiring Devices

1.3 REFERRENCE STANDARDS

A. RoHS – Restriction of Hazardous Substances. Council of the European Union (EC) Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

B. LM-79-08 (or latest) – IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.

C. LM-80-08 (or latest) – IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.

D. TM-21-11 (or latest) – IES Technical Memorandum on Projecting Long Term Lumen Maintenance of LED Light Sources.

E. NEMA SSL 1-2010 (or latest) – Electronic Drivers for LED Devices, Arrays, or Systems.

1.4 SUBMITTALS

A. Include outline drawings, lamp and ballast data, support points, weights, accessory information and performance data for each luminaire type.

B. For each luminaire type, submit luminaire information including catalog cuts with highlighted catalog numbers and required accessories:
   1. Luminaire:
      a. Manufacturer and catalog number,
      b. Type (identification) as indicated on the plans and schedule,
      c. Delivered lumens,
      d. Input watts,
      e. Efficacy,
      f. Color rendering index.
   2. Driver:
      a. Manufacturer and catalog number,
      b. Type (Non-Dimming, Step-dimming, Continuous dimming, etc.),
      c. Power Factor, Crest Factor, THD, etc.

1.5 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.6 EXTRA MATERIALS

A. Provide three (3) percent of each lamp type, but not less than one (1) of each type.

B. Provide one (1) of each type of LED module, light bar, or array (if applicable). If the LED's are integrated into the luminaire and are not separate components, provide one (1) of each of these types of luminaires.

C. Provide one (1) LED driver or ballast of each type.

1.7 DEFINITIONS

A. Driver: The power supply used to power LED luminaires, modules, or arrays.

B. L70, L70, or L70%: The reported life of an LED component or system to reach 70% lumen maintenance, or 70% of the LED's original light output. This test is being developed by the IES and is currently described by TM-21-11.

C. LED's: Broadly defined as complete luminaire with light emitting diode (LED) packages, modules, light bars or arrays, complete with driver.

D. LED luminaire failure: Negligible light output from more than 10 percent of the LED's constitutes luminaire failure.

PART 2 PRODUCTS

2.1 INTERIOR LUMINAIRES AND ACCESSORIES

A. See the Luminaire Schedule on the drawings for type of luminaires and catalog numbers. Luminaires manufactured by others are equally acceptable provided they meet or exceed the performance of the indicated luminaires, meet the intent of the design, and are approved by the A/E & Owner prior to bid. Failure to submit/receive approval from A/E & Owner prior to bid shall be sufficient justification for denying any/all substitutions.

B. Luminaire shall be certified by a Nationally Recognized Testing Laboratory (UL, ETL, or IEC).

C. Provide luminaires with quick-connect disconnecting means, similar to Thomas & Betts Sta-Kon.

2.2 LED LUMINAIRES

A. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:
   1. Minimum Light Output.
   2. Zonal Lumen Requirements.
   3. Minimum Luminaire Efficacy.
   4. Minimum CRI.
   5. L70 Lumen Maintenance.
   6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.

B. Additional requirements:
   1. Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).
   2. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 5-step MacAdam Ellipse binning process.
   3. Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.
   4. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
   5. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
   6. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
   7. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
   8. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
   9. Luminaire and driver shall be furnished from a single manufacturer to ensure compatibility.
   10. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.

11. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
12. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
13. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
14. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
15. All luminaires shall be provided with knockouts for conduit connections.
16. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
17. Provide all of the following data on submittals:
    a. Delivered lumens
    b. Input watts
    c. Efficacy
    d. Color rendering index.
18. LED Luminaires used for Emergency Egress Lighting:
19. The failure of one LED shall not affect the operation of the remaining LEDs.
20. Emergency LED Luminaire Compatibility with Inverters:
21. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire manufacturer that the luminaire will function with a square-wave inverter.

2.3 LED DRIVERS

A. General:
1. Provide driver type (non-dimmed, step-dimmed, continuous-dimming, etc.) as indicated on the luminaire schedule on the drawings.
2. Minimum Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
3. Driver shall have a rated life of 50,000 hours, minimum.
4. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
5. Driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
6. Driver shall operate normally for input voltage fluctuations of plus or minus 10 percent.
7. Driver shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
8. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
9. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
10. Provide all of the following data on submittals:
    a. Input watts
    b. Power Factor (pf)
    c. Crest Factor (cf) at full input power
    d. Total Harmonic Distortion (THD).

B. Dimming Drivers:
   1. LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.
   2. Continuous Dimming Drivers: LED luminaires shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Luminaire Schedule on the plans without visible flicker or "popcorn effect". "Popcorn effect" is defined as the luminaire being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when power is returned to the luminaire. Continuous Dimming Drivers shall use 0-10V control.

PART 3 EXECUTION

3.1 INSTALLATION

A. Verify ceiling types with Architectural plans or with existing ceilings. Verify specified luminaires are compatible with specified ceiling type(s) prior to ordering luminaires.

B. Install in accordance with manufacturer's instructions.

C. Install suspended luminaires using aircraft cable, or pendants supported from swivel hangers. Heavy duty chain supports may be used where indicated on the luminaire schedule. Provide aircraft cable, pendants, or chain lengths required to suspend luminaire at indicated height. All aircraft cables or pendant supported luminaires shall have an independent support to structure at all cable or pendant support locations. When chain is used, tie-wrap the luminaire whip to the chain.

D. Support luminaires larger than 2 x 4 foot (600 x 1200 mm) size independent of ceiling framing.

E. Provide independent support for all luminaires over 50 lbs.

F. Locate ceiling luminaires as indicated on reflected ceiling plan.

G. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

H. The Contractor shall install luminaire supports as required. Luminaire installations with luminaires supported only by insecure boxes will be rejected. It shall be the Contractor's responsibility to support all luminaires adequately, providing extra steel work for the support of luminaires if required. Any components necessary for mounting luminaires shall be provided by the Contractor. No plastic, composition or wood type anchors shall be used.

I. Install recessed luminaires to permit removal from below.

J. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

K. Install code required hardware to secure recessed grid supported luminaires in place.

L. Install wall mounted luminaires and exit signs at height as scheduled. Use pendants supported from swivel hangers in exposed ceiling/structure locations where necessary to mount exit signs at the specified height.

M. Install accessories furnished with each luminaire.

N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

O. Bond luminaires and metal accessories to branch circuit equipment grounding conductor.

P. Install specified lamps in each luminaire and exit sign.

Q. Dimmed luminaire circuits shall have separate neutrals.

R. Dimmed LED luminaires shall have a positive OFF, which requires turning off the circuit to the luminaire so that the luminaires don't "glow" at the lowest dimmed setting. This shall be accomplished using a switch, relay, or some other means acceptable to A/E.

S. All lamps shall be delivered to the job in sealed cartons and protected from dirt and dust during storage on the project. Lamps shall be taken directly from the cartons and installed in the luminaire with special care so that they do not become dusty and are not soiled in the operation.

T. All new lamps shall be operational at the Substantial Completion of the project.

3.2 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Aim and adjust luminaires as indicated on Drawings or as directed by the A/E.

C. Touch up luminaire finish at completion of work.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Interface with air handling accessories furnished and installed under Division 23.

B. Provide controls as indicated on the plans. Refer to section 26 27 26 - Wiring Devices. Controls shall be compatible with the luminaires/ballasts/drivers being installed.

3.4 ZERO-TO-10V DIMMING CONTROL WIRING INSTALLATION

A. Zero-to-10V dimming control conductors are classified by the NEC as Class 2 conductors and shall be kept separate from line-voltage conductors per NEC 725.136(A). Matching the insulation rating of Conductors of Different Systems does not apply to Class 2 conductors per NEC 300.3(C)(1), Informational Note No.1.

B. Wall box dimmers will typically have two conduits: One conduit for line-voltage power, and one conduit or conduit stub for the 0-10V control wiring.

C. The 0-10V wiring may be routed in free air if:
   1. The room is approximately 900 sq.ft. or less,
   2. The 0-10V wiring stays within the room,
   3. The ceiling space is a non-plenum space, and
   4. All splices of 0-10V wiring are spliced in a box.
   5. The 0-10V wiring may be tie-wrapped to the outside of the luminaire fixture whip per NEC 300.11(B)(2). Tie-wraps shall be UL listed for UV resistance.

D. At each luminaire, separate openings (either manufactured knock-outs or punched openings) shall be used for the line-voltage power and the 0-10V wiring. The EC shall use an NM cable connector at the opening for the 0-10V wiring. Zero-to-10V conductors entering and within a luminaire enclosure shall maintain a minimum separation of 6 mm (0.25 in.) per NEC 725.136(D).

3.5 METAL-CLAD (MC) CABLE

A. Metal-Clad (MC) type cable that combines power and Class 2 circuits into a single cable may be used for the luminaire wiring within a single room. Examples of such products are Encore Wire® MC-LEDTM or Southwire® MC-PCS DuoTM. Manufacturer's names and catalog numbers are used for quality and performance only. MC Cables manufactured by others shall be equally acceptable provided they meet or exceed in performance and quality as specified.

3.6 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.7 LUMINAIRE CONNECTIONS

A. Recessed, including Master-Satellite connections:
   1. Use a luminaire fixture whip from a J-box for recessed lay-in luminaires. Luminaire fixture whips shall be aluminum or steel AC Cable (Armored Cable) or Flexible Metal Conduit (FMC).
   2. Cable/Conduit whips shall be 3/8" (10 mm) minimum diameter, six feet (1.8 m) maximum length.
   3. Flexible whips or pre-wired systems between master and satellite luminaires may be supported by the ceiling grid wires.
   4. The flexible connectors shall be steel, galvanized, clamp type with locknut, snap-in type with locknut, or snap-in connector type, including those used on the master-satellite units.

B. Chain or Cable Hung (unfinished spaces):
   1. Use manufacturer’s SO cord or a luminaire fixture whip from a J-box. Luminaire fixture whips shall be aluminum or steel AC Cable (Armored Cable) or Flexible Metal Conduit (FMC).
   2. Conduit whips shall be 3/8" (10 mm) minimum diameter. Conduit whip or SO cord shall be cut to length (six feet (1.8 m) maximum) and shall allow movement of the chain/cable/luminaire, but shall not be long enough to “loop” and shall present a neat and workmanlike appearance.
   3. Luminaire field wired flexible cord installations shall be connected per NEC 410.62.
   4. The flexible connectors shall be steel, galvanized, clamp type with locknut, snap-in type with locknut, or snap-in connector type, including those used on the master-satellite units.

5. Conduit whip slack shall be tie-wrapped to the chain supports. Tie-wraps shall be UL listed for UV resistance.

C. Cable Hung (finished spaces):
   1. Use manufacturer's SO cord from luminaire to a J-box.
   2. SO cord shall be cut to length (six feet (1.8 m) maximum) and shall allow movement of the cable/luminaire, but shall not be long enough to "loop" and shall present a neat and workmanlike appearance.
   3. SO cord slack may be tie-wrapped to the cable supports. Tie-wraps shall be UL listed for UV resistance.
   4. Luminaire field wired flexible cord installations shall be connected per NEC 410.62.

D. Surface Mounted (unfinished spaces):
   1. Provide direct conduit and box connection.

E. Surface Mounted (finished spaces):
   1. Provide direct conduit and box connection. Use surface metal raceway where indicated on drawings. Conceal box and conduit where appropriate. Flexible metal conduit shall not be used where it is exposed.

END OF SECTION

SECTION 27 00 05
COMMUNICATIONS CABLING

PART 1 – GENERAL

1.1. SCOPE OF WORK

A. This section specifies the requirements for product design, performance, quality assurance, and contractor responsibilities for the execution of work to install a complete Category 6 (CAT6) structured cabling system.
B. Execution of work includes but is not limited to the delivery and storage of materials, preparation, installation, field testing, and project completion tasks.
C. System certification and warranty requirements for completed work and future moves, adds, and changes (MACs) are also specified in the section.

1.2. RELATED SPECIFICATIONS

A. Section 01 33 23 Submittals
B. Section 27 21 33 Wireless Access Points (WAP)

1.3. CONTRACTOR QUALIFICATIONS

A. The Contractor shall have experience in the installation and testing of similar systems a specified in the plans and specifications for this contract.
    1. The Contractor shall have completed at least 2 projects of similar size and scope within the last 24 months.
    2. The contractor shall provide references upon request. Information to provide shall include project name, address, date of installation, client name, title, telephone number, and project description.
B. The Contractor shall be certified by the connectivity manufacturer to install, service and warranty the specified product from the time of bidding through the duration of the contract installation and warranty period.
D. The Contractor must maintain a State Contractors License as required by the State of Wisconsin.
E. All members of the Contractors installation team must be certified by the manufacturer as having completed the necessary training to complete their part of the installation. All personnel shall be adequately trained in the use of tools and equipment required for the complete installation.
F. The Contractor shall own and maintain tools, installation equipment, and testing equipment necessary for the successful installation and testing of Optical and Category 5E, 6, and 6A premise distribution systems.
G. The Owners reserves the right to require the Contractor to remove from the project any such employee the Owner deems to be incompetent, careless, or insubordinate.

1.4. DRAWINGS AND INSPECTION OF THE SITE

A. The Communication (Technical) floor plan drawings are in PDF format, are not typically dimensioned, and should not be scaled. The contractor should refer to the Architectural sheets and construction details for dimensions.

B. The Contractor shall review all site conditions prior to submitting a bid for this project. Any obvious discrepancies between site conditions and the bidding documents shall be brought to the attention of the Architect/Engineer immediately so clarification can be made to the bidding documents by addendum.
C. Any existing wires, utilities, or equipment shown on the drawings as existing are for general information and to the best knowledge of the Architect/Engineer. The contractor shall field verify all existing conditions.
D. The contractor shall field verify distances and equipment placements, and coordinate all installation locations with other trades, construction managers and the general contractor prior to installation.
E. Change order requests for additional material or labor costs due to the contractors lack of knowledge of existing field conditions will not be allowed.

1.5. SUBMITTALS

A. The Contractor shall review Section 01 33 23 Submittals for additional information.
B. The Contractor shall provide a complete submittal package prior to ordering equipment and materials. Partial submittals will not be considered. A complete submittal shall include but not be limited to the following:
    1. Manufacturers data (specifications, "Cut Sheets")
    2. Wiring diagrams for all installed cabling
    3. Equipment rack and cabinet layouts
    4. List of cabling distances (typical and maximum) for all structured cabling
B. The Contractor shall provide all license and certification documents for the project manager and all project technicians as part of the product submittal. All documents shall be valid through the completion of the installation and warranty period. Documents shall include but not be limited to the following:
    1. State of Wisconsin Contractors license
    2. Structured cabling and termination equipment installation certifications for:
        a. Copper
        b. Optical Fiber Connectivity
        c. Cabling
C. Product submittals are required for sole source products.
D. Product submittals are not required for Owner provided equipment and materials. However miscellaneous materials required for a complete installation of Owner provided equipment may be necessary.
E. Work shall not proceed until all submittal items have been approved.

1.6. PRODUCT SUBSTITUTIONS

A. The Contractor shall thoroughly review all specifications associated with the Division 27 installations for product specific information.
B. Substitutions for sole sourced products will not be permitted.
C. Substitutions for items to be considered as equals shall be submitted for review at the time of bidding in accordance with the bidding instructions. Approved substitutions will be identified by a written addendum to the bidding documents prior to the end of bidding. Only items in the approved addendum will be allowed as substitutions.

1.7. TESTING

A. Prior to testing, provide a summary of the proposed test plan for each cable type including equipment to be used, set-up, test frequencies or wavelengths, results format, etc. Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.

PART 2 - PRODUCTS

2.1. GENERAL

A. This section indicates pre-approved product manufacturers, specific products, or minimum product performances. Substitutions/alternates to this information shall only be allowed as described in paragraph 1.7 above.
B. The manufacturer of the connectivity products specified in this document as required for construction of the cabling infrastructure shall be:
   1. Hubbell Premise Wiring
C. The manufacturer of the cabling products specified in this document as required for construction of the copper cable infrastructure shall be:
   1. Mohawk Cable
D. The manufacturer of the fiber optic cabling products specified in this document as required for construction of the fiber optic cable shall be:
   1. Mohawk Cable
   2. Pre-approved equal

2.2. WORK AREA CONNECTORS

A. Category 6 Jacks
   1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
   2. Jacks shall be designed for 4-pair, 100 Ohm balanced un-shielded twisted pair (UTP) cable.
   3. Jacks shall terminate 26-22 AWG solid or stranded conductors.
   4. Jacks shall include a dust cap for wire retention.
   5. Jacks shall accept FCC compliant 6-position plugs.
   6. Jacks shall have attached wiring instruction labels to permit either T568A or T568B wiring configurations.
   7. CAT6 jacks shall be backward compatible with existing category 3, 5, and 5E cabling systems for fit, form and function.
   8. Jacks shall be manufactured in the USA.
   9. CAT6 jacks shall meet or exceed CAT6 transmission requirements for connecting hardware as specified in ANSI/TIA/EIA-568-C-2 transmission performance specifications for 4-pair 100 ohm.
   10. Jacks shall be UL listed and CSA certified.
   11. Colors shall be specified by the Owner.
   12. CAT6 modular jacks shall be:
      a. Hubbell
         i. HXJ6EI (Category 6 – Ivory)

2.3. FACE PLATES

A. All faceplates shall meet the following specifications

1. Faceplates shall UL listed, CSA certified, and shall be constructed of high impact UL94 V-0 rated thermoplastic.
2. Faceplates shall be compatible with standard NEMA openings and boxes.
    a. Faceplates for single gang boxes shall be 2.75" W x 4.5" H (69.8 mm x 114.3 mm).
    b. Faceplates for double gang boxes shall be 4.5" W x 4.5" H (114.3 mm x 114.3 mm).
    c. Mounting screws shall #6-32 pan head Phillips/slotted and color matched to the faceplate.
3. Port size in each faceplate shall fit the CAT6 modular jack or snap-fit fiber optic, audio, and video modules for multi-media applications.
4. Faceplates shall be rear loading with a designation window.
5. Faceplates shall be provided with clear plastic and color matched label field covers, and shall provide ANSI/TIA/EIA-606-A compliant workstation outlet labeling.
6. Work area faceplates shall be
    a. Hubbell (IFP series)
        i. IFP14EI (4-port Ivory)

2.4. CABLE

A. Category 6 UTP
1. Plenum cable construction shall be four twisted pairs of 23AWG insulated solid conductors with a ripcord surrounded by a tight outer jacket.
2. Non-plenum cable construction shall be four twisted pairs of 23AWG insulated solid conductors with a ripcord surrounded by a tight outer jacket.
3. No minimum compliant cable will be accepted, this facility requires additional band width.
4. The ripcord shall be directly underneath the outer jacket.
5. Cable shall be marked with the manufacturer and pertinent information. UL, ETL, or CSA agency certification or verification markings shall be on the cable jacket according to the certifying agency's requirements.
6. Color coding of pairs shall be as follows:
    a. Pair 1: white/blue; blue
    b. Pair 2: white/orange; orange
    c. Pair 3: white/green; green
    d. Pair 4: white/brown; brown
7. Plenum or riser rated jackets
8. Cable shall be supplied in 1000 foot spools or 1000 foot Reelex boxes.
9. Cable shall exceed CAT6 transmission requirements specified in ANSI/TIA/EIA-568-C-2.
10. Cable shall be UL and C(UL) listed.
11. Cable shall exceed the requirements of TIA/TSB-155, 10 GB/S Ethernet operation over 37 meters channel length.
12. CAT6 UTP horizontal distribution cable as specified in the contract documents shall be
    a. Mohawk Advancenet Cable
        i. Plenum M57193
        ii. Riser M57202

B. Backbone distribution cable – Fiber Optic
1. Single-mode fiber backbone distribution cable shall be available with multi-strand construction for intra-building applications.

2. OFNR or OFNP will be determined at each site. The contractor shall be responsible to assure that the proper type of jacketing is being used. Failure to meet local code will cause the replacement of at no expense to the Owner.
3. Single-mode fiber shall be dispersion un-shifted fiber in compliance with ANSI/TIA/EIA-492 CAAA.
4. Intra-building fiber distribution cable design shall be according to ANSI/ICEA S-83-596.
5. Single-mode backbone fiber distribution cable, when installed, shall exceed the performance requirements of ANSI/TIA/EIA-568-C-3.
6. Single-mode optical fiber distribution cable shall be:
    a. Mohawk Cable (basis of design)
        i. Single-mode riser M9W042 (12 strand), unless otherwise specified by the Owner.
        ii. Single-mode plenum M9W048 (12 strand), unless otherwise specified by the Owner.
    b. Pre-approved equal.

2.5. CONNECTORS – FIBER OPTIC

A. Pre-polished fiber connector basic design shall be a factory pre-polished LC-style optical fiber connector with a zirconium ceramic ferrule.
B. Index-matching gel is factory injected into the cleaved fiber stub splice to minimize connector insertion loss.
C. LC single-mode factory pre-polished connectors shall have pre-installed fibers.
D. Connector materials shall be designed with thermal stability to comply with environmental requirements of ANSI/TIA/EIA-563-B.3 and Telcordia GR-1081-CORE.
E. Pre-polished LC connectors shall require no field polishing and require no adhesives for termination.
F. Connector design and termination technique shall be independent of cable type or manufacturer, and shall be compatible for either 900 micron buffer or 250 micron buffer distribution cables.
G. Pre-polished LC fiber connectors when properly installed onto qualified cable shall meet the 10GB/S Ethernet performance requirements of IEEE802.3.
H. LC fiber connectors when properly installed onto qualified cable shall exceed the mechanical and environmental performance requirements of ANSI/TIA/EIA-568-C-3.
I. Multi-mode optical fiber horizontal distribution cable shall be:
    1. Hubbell (Prolick)
        a. Single-mode LC – FCLC900KSM12
    2. AFL (Fast)
        a. Single-mode LC – FAST-LC-SM

2.6. PATCH PANELS – CATEGORY 6

A. CAT6 patch panels shall be standard 8-position, RJ-45 style, un-keyed, FCC-compliant receptacle in 24 and 48 port configurations.
B. Panel frames shall be black powder coated 14 gauge steel with rolled edges on top and bottom for proper stiffness.
C. Panels shall accommodate a minimum of 24 ports for each rack mount unit (1 RMU=1.75 inches). 48 ports are recommended.
D. Panels shall be designed for 4-pair, 100 ohm balanced unshielded twisted pair (UTP) cable.
E. Panels shall terminate 26-22 AWG solid connectors

F. Panels shall have individual port identification numbers on the front and rear of the panel. Panels shall have the CAT6 designation visible from the front when installed.
G. Printed circuit boards shall be fully enclosed front and rear for physical protection.
H. Panel contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
I. Panel termination method shall follow the industry standard 110 IDC punch-down using a standard 110 impact termination tool.
J. CAT6 panels shall be backward compatible with existing category 3, 5, and 5E cabling systems for fit, form, and function.
K. CAT6 patch panels when installed shall exceed the link or channel performance requirements of ANSI/TIA/EIA-568-C.2.
L. CAT6 patch panels shall be able to accommodate 10G in a 37 meter channel per TSB-155.
M. CAT6 patch panels shall be:
    1. Hubbell (Nextspeed 6 series)
        a. 24 port – P6E24U
        b. 48 port – P6E48U

2.7. RACKS – FREE STANDING – 2 POST

A. Rack material shall be structural aluminum with durable black polyurethane powder coat finish.
B. Installed racks shall have a static load capacity of 500 lbs.
C. Racks shall be available in either 19 inch or 23 inch standard rack configurations
D. Tapped holes in the vertical rails for mounting of panels shall be #12-24 thread size. Coating shall not interfere with the thread fit.
E. The standard rack height shall be 7 feet (84 inches) and have a capacity of 45RMU.
F. Rack base angles shall be pre-drilled for floor mounting and for assembly to vertical rails.
G. Racks shall accommodate expansion of cable capacity and added volume for CAT6 cabling.
H. Free standing racks and accessories shall be:
    1. Hubbell (Nextframe series)
        a. HPW84RR19
I. *NOTE:* Each basic rack delivered shall consist of equipment rack, isolation pads, 18" wide black ladder rack and mounts to secure to the rack, a vertical electrical 20 amp outlet strip (minimum of 6 duplex receptacles) with mounting brackets.

2.8. CABLE MANAGEMENT – VERTICAL

A. Vertical jumper management shall provide for cable routing on front and rear of each rack and be 3½" square (minimum). Vertical Jumper Management hardware shall mount on spacers attached to the rack uprights and not on the upright itself. Where multiple racks are to be installed, this hardware shall be mounted between the uprights of adjacent racks. Rack uprights and the spacers shall be secured together per manufacturer recommendations.
B. Rack shall be equipped with Vertical Jumper Management Hardware as to allow an orderly routing of twisted pair, optical fiber and coaxial jumpers from the patch panels to the customer provided network equipment.
C. Hardware shall provide for cable routing on front and rear of each rack.
D. Vertical managers shall:
    1. Have non-metallic fingers spaced no greater than and aligned with each Rack Unit indicator on the equipment rack.
    2. Be equipped with hinged front and rear doors that cover the cable routing area.

E. Channel dimensions: Minimum width: 6” at end-of-row, 8” between adjacent racks or as shown on project drawings.
F. Hardware shall be designed to mount on spacers attached to the rack uprights and not on the upright itself.
    1. Where multiple racks are to be installed, mount hardware between the uprights of adjacent racks.
    2. Secure rack uprights and spacers together per manufacturer recommendations.
G. Cabinet(s) shall be equipped with vertical and horizontal cable management hardware, in the form of rings and guides, as to allow an orderly routing of optical fiber and twisted pair jumpers from the patch panel to the customer provided network equipment.

2.9. CABLE MANAGEMENT - HORIZONTAL

A. Provide horizontal cable management hardware adjacent to (above or below) each row of jacks in a Modular Patch Panel.
B. Equipment Rack shall be equipped with Horizontal Jumper Management Hardware as to allow an orderly routing of twisted pair, optical fiber and coaxial jumpers from the patch panels to the customer provided network equipment.
C. Horizontal Jumper management hardware shall be:
    1. A 2 RU (3.5”), plastic or painted steel panel.
    2. Configured with a minimum of five (5) Jumper distribution rings (1.75" x 3.75" minimum dimension).
D. Cabinet(s) shall be equipped with vertical and horizontal cable management hardware, in the form of rings and guides, as to allow an orderly routing of optical fiber and twisted pair jumpers from the patch panel to the customer provided network equipment. At a minimum, provide one such horizontal jumper management panel with each cabinet.

2.10. INNER - DUCT

A. Fiber optic cable shall be installed with inner-duct for protection of fiber cables in a shared pathway.
B. Inner-duct shall be rated for the plenum or riser environment that it is being installed in.
C. Three inner-ducts shall be run between closets. One for current installation and two spare for future applications.
D. Size: 1” corrugated
E. Flexible and light weight
F. Pre-threaded with pull line.

PART 3 - EXECUTION

3.1. GENERAL

A. Refer to Project Drawings which indicate Equipment Outlet locations, major cable routes and termination location(s) within each building. Coordinate duct allocation with the Agency.
B. Furnish and install all cables, connectors, hardware and equipment as shown on drawings and as specified above.
C. It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.
D. The contractor will be responsible for identifying and reporting to the Owner’s Construction Representative any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable,

raceway or other hardware must be repaired by the Contractor. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced by the contractor to match color, size, style and texture.

E. Where unacceptable conditions are found, bring this to the attention of the Owner's Construction Representative immediately. A written resolution will follow to determine the appropriate action to be taken.
F. Beginning installation means contractor accepts existing conditions.
G. Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings with the respect or regard to the quality, value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work disturbed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.
H. All cables, termination components and support hardware shall be furnished, installed, tested and documented by the Contractor unless noted otherwise

3.2. DELIVERY, STORAGE, AND HANDLING

A. Materials delivered to the site shall be stored in a clean, dry, and secured area, preferably indoors and shall not interfere with other construction activity.
B. Storage temperature shall adhere to the manufacturers recommendations.
C. Handling of any materials packaged or un-packaged shall be in such a manner as to avoid damage to the item.
D. Installation of CAT6 cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature shall above 50 f is recommended.

3.3. PREPARATION

A. Cable Pathways and Firestops
   1. Cable pathways including but not limited to conduit, cable trays, ladder racks, raceway, slots, sleeves, etc. shall be located and mounted according to the contract drawings and manufacturers installation instructions. Pathways shall not be installed in wet areas.
   2. Cable pathway fill ration, bend radius , run length, number of bends, and proximity to EMI sources shall be in accordance with ANSI/TIA/EIA-569-B. Maximum cable count of the initial installation shall not exceed 40% fill ration in any one pathway.
   3. In accordance with NEC 2005 power wiring and communications cabling shall not share the same pathway or outlet unless separated by a physical barrier.
   4. Cable pathways shall be secured to a structural member of the building or permanent wall studs. Wall surfaces for raceway mounting should be finished complete.
   5. Metallic pathways shall be electrically continuous, free of sharp edges, and properly bonded to an approved ground. EMI sources such as ballasts, motors, and bus conductors shall be avoided by using proper separation distances.
   6. Pathways that penetrate fire-rated barriers shall be fire stopped according to local codes and recognized practices. Fire stop materials or devices shall be qualified to UL-1479 in accordance with ASTM E814. Fire stop method shall have the Architect/PE approval.
   7. Core drilling of holes for fire-rated poke through outlet devices shall have approval of the structural engineer or PE on the contract drawings prior to starting the work.
   8. Pathways for vertical cable runs such as slots and sleeves shall be installed in the proper location in accordance to applicable codes and standards.
B. Telecommunication Rooms and Equipment Rooms

1. Telecommunication Room (TR) layout and location shall be in accordance with the guidelines of ANSI/TIA/EIA-569-B. TR's shall not be installed in wet areas, near EMI sources, or caustic chemicals.
2. Layouts of rack, cabinet, or enclosure locations shall be according to the approved submittal drawings.
3. Racks and cabinets shall be secured to the floor suing proper anchors and fasteners.
4. Mount and assemble racks, cabinets, brackets, and enclosures per the manufacturer's installation instructions. Mount patch panels and cable management accessories in the specified sections.
5. Adjoining pathways (ladder rack, cable tray, etc.) shall be properly secured and positioned to allow adequate bend radius of cables entering the rack or cabinet.

C. Wall outlets and recessed wall boxes
1. Wall outlet and cable drop pathway location shall be according to contract drawings. Guidelines from ANSI/TIA/EIA -569-B should be followed for location with electrical outlets, and outlet height above finished floor.
2. Outlet boxes shall be fastened securely to a wall stud or structural element in a manner that permits flush mounting of the faceplate with the finished wall.
3. Multi-connect boxes shall be installed in a manner to comply with separation rules for power and communications wiring in close proximity.
4. Refer to specific manufacturer's recommendations for wall outlet selection, cable deployment, and termination of jacks into faceplates.

D. Surface housings and MUTOA outlets
1. Raceway or conduit should be deployed to the surface housing location for through wall cable entry. Cut the wall opening to match the location in the housing base.
2. Layout mounting holes onto the desired wall location. For wallboard, concrete, or cinder block walls drill to the proper depth and install anchors.
3. Always use the appropriate wall anchors for the wall material being anchored to. Installing mounting screws without using anchors will not be permitted. Mounting to studs is preferred.
4. Mount base plate or surface box or MUTOA to outlet location using the proper fasteners. Note: furniture and wall outlet applications require mounting of the base plate prior to cable pulling and connector termination.
5. Install cover and base plates.
6. Refer to detailed manufacturer's guidelines for cable deployment and termination of jacks into surface housings. Due to the larger size of CAT6 cables proper cable bend radius must be maintained. Certain restrictions may apply when dressing CAT6 cabling in to surface housings.

3.4. INSTALLATION

A. Cable Support
1. The contractor shall install all supports for cables specified in this section. Traditional ladder rack shall be used in each Telecommunication Room. Basket and J-hooks shall be used for horizontal cable support.
2. Cable supports shall be spaced randomly but no further than 5'-0"apart.
3. Inner-ducts shall be run between each wiring closet or Telecommunications Room. One shall be for current installation with three multi-cells for future installations or changes. In each Telecommunications Room the inner-ducts entering the space will be combined in a size appropriate metallic box that is mounted on the wall. The combined inner-ducts will then be routed to the rack and the fiber bay.

4. The Contractor shall provide all incidental cable management products required for a complete and neat cabling installation. Incidental products include but are not limited to sleeves or conduit raceways required to protect exposed cabling.
5. A horizontal conduit system consists of conduits radiating from the telecommunications Room to the workstation outlets in the floor, walls, ceilings, and columns of the building. When using a conduit distribution system utilize the most direct route following the building lines.
6. The size and number of conduits or sleeves used for backbone pathways depends on the usable floor space served by the backbone system. At least three 4 trade size sleeves are recommended.
7. Conduit is only required if building codes or environmental conditions require it. Rigid or EMT metal conduits are suitable for building installation. Adequate planning should allow for a minimum of 1-inch conduits to each workstation location if code requires conduit for voice and data cables.
8. Conduit fill ratios shall not exceed 40%. Contact the cable manufacturer to get recommendations on fill rates.
9. No conduit run should be designed with more than two (2)-90 degree bends between pull points or pull boxes. If a run requires more than two (2)-90 degree bends install a pull box.
    a. Exceptions to this shall be as follows:
        i. The total run is not longer than 33 feet.
        ii. The conduit size is increased to the next trade size larger.
        iii. One of the bends is located within 12 inches of the cable feed end (this exception only applies to placing operations where cable is pushed around the first bend).
10. All conduits shall be equipped with a contiguous length of plastic or nylon pull string with a minimum rating of 200 lbs (90 Kg).
11. A conduit run shall not be designed with continuous closed sections longer than 100 feet without pull points or pull boxes installed.
12. All conduits should terminate above on in the installed ladder racks and allow for proper cable racking. Cable materials should be considered in areas that have excessive distance between the conduit and ladder rack.
13. Trays and conduits located within the ceiling shall protrude into the room a distance of 1 to 2 inches without a bend and at least 8 feet above finished floor. Clear unobstructed access to the ladder rack and conduits shall be provided within Telecommunications Rooms.
14. Conduits entering through the floor shall terminate at least two (2) inches above the finished floor.
15. Locate slot/sleeve systems in places where pulling and termination will provide the easiest access.
16. If possible locate sleeves, slots, and/or conduits on the left side of the room. This placement enhances the use of wall space from left to right.
17. When possible entrance conduit and distribution conduit/cable tray should enter/exit on the same wall. If this is not possible provide and install ladder rack inside the room for distribution from wall to wall.
18. All floor penetrations shall be core drilled with a maximum of 1/4 inch size greater than the exterior diameter of the riser conduit.
19. Conduits entering through a wall shall be reamed, bushed, and terminated as close as practicable to the terminating rack or wall.
20. Terminations above the suspended ceiling shall terminate no less than 3 inches above the finished ceiling and shall be finished with a bush opening.

21. All conduit shall be labeled for easy identification.
22. All floor penetrations shall be at columns, exterior walls, or in equipment rooms.
23. Cables shall be supported at the height of the bottom flange of structural beams using a rigid support method (I.E. threaded rod, beam clamps, etc.)
24. Do not support cables from duct work, sprinkler piping, water piping, waste/vent piping, conduit, ceiling wire, or other support systems.
25. The conduits or sleeve will be installed per TIA/EIA-569-B and shall have all penetrations sealed with an approved fire stop product.
26. Provide independent support systems for each low voltage cabling system.

B. Cable

1. CAT6 cable will be run for data. CAT6 gel filled cable will be run in the backbone for all communications applications. Certain environments may require the use of different cables and/or cable jackets.
2. All terminations shall utilize T568B wiring. The Contractor shall be responsible for removing/replacing any wiring that is not in compliance with this requirement at no additional cost to the owner.
3. Maximum cable lengths to be 295 feet (90 m) including the service loop. Provide all necessary installation materials, tools, and equipment to perform insulation displacement type terminations at all communications outlets and patch panels.
4. All communication cabling that has become abandoned as part of new renovation, previous renovation, or used as temporary communication cables during the construction process shall be completely removed.
5. Refer to detailed manufacturers guidelines for deployment of CAT6 cable. Certain restrictions apply and specific techniques are recommended.
6. All cabling shall be installed in accordance with the manufacturers written bend radius and pulling tensions. General industry guidelines recommend the following:
    A. Tensile loading of a single 4-pair copper UTP cable shall not exceed 25 LBF
    B. Bend radius of a single 4-pair copper UTP cable shall not exceed 4 times the diameter of the cable.
    C. Bend radius of multi-pair copper UTP and optical fiber cable shall not exceed 10 times the diameter of the cable.
7. All conduits and conduit sleeve shall have bushings or grommets installed prior to the installation of communications cables to avoid damage and abrasions to the cable sheathing and insulation. If bushings are installed by the electrical contractor the communications cabling contractor shall furnish and install bushings prior to pulling communications cabling.
8. Horizontal cable length for 4-pair copper UTP cables shall not exceed 295 feet. The contractor is responsible for reviewing the plans and specifications prior to bidding and installation and shall notify the Communications Design Engineer of cable runs that may exceed 295 feet.
9. Splices shall not be permitted in any voice or data cable unless otherwise specified or shown on the drawings.
10. Copper cables shall not be placed near sources of extreme heat (I.E. boilers, radiators, heat coils, etc.).
11. Maintain cable twists for all UTP cables. For terminations, cable sheathing shall be stripped back no more than 1/2 inch from the termination point for all CAT6 cables.
12. All cables shall be supported by cable tray, cable runway, or J-hooks. When large quantities of cables leave trays or runways, cables shall be supported by drop-outs or cable support hardware manufactured specifically for the purpose of supporting cables. J-hooks shall be installed a minimum of every 5 feet and cabling shall maintain

minimal deflection and strain (less than 12" deflection). Cables shall not be supported from ceiling grid wires. Cables shall not run above steel joists.

13. All cables shall be separated and bundled into like groups.
14. Service loops shall be provided at both ends of installed horizontal and backbone cabling. A 12" service loop shall be installed in the ceiling space near workstation outlets (excessive cable shall not be coiled in outlet boxes). A 10 foot service loop shall be provided in Telecommunication rooms and shall be installed to allow for future equipment rack/cabinet relocations without the need to re-terminate patch panels. The 10 foot service loop shall be neatly bundled and secured in the ceiling space with large D-rings or placed in cable trays. Cable slack and service coils shall be stored properly above the ceiling or under the access floor. A "figure-eight" service loop is recommended for CAT6 cabling to reduce EMI coupling. Loose random bundling is recommended.
15. Any cabling installed in equipment rooms shall be neatly placed in cabling trays, cabling runways, or horizontal and vertical rack/cabinet cable management devices.
16. Only Velcro straps shall be utilized for cable bundling. Tie wraps, zip ties, and other such rigid devices will not be permitted when bundling cables.
17. Maintain the following separation distances between cables, other system cables, and other building systems:
    a. One (1) foot from fluorescent lights
    b. One (1) foot from power cables in parallel
    c. One (1) foot from electrical conduits or other system cables and electrical equipment
    d. Four (4) feet from motors and transformers
    e. Three (3) feet from hot water piping and other mechanical equipment
    f. Ten (10) feet from bus conductors or high current branch circuits
    g. All low voltage cables shall be run parallel or at right angles to building structural framework. Do not run cables diagonally across ceiling space without written authorizations by the Communications design Engineer or the Owners Representative.
    h. Communications cabling that must cross power cables or conduit shall cross at a 90 degree angle and shall not make physical contact.
18. Fire seal around all cables running through rated floors and walls. Firestop all cables and pathways that penetrate fire-rated barriers using approved methods, materials and in accordance with all local codes.
19. Contractor shall install a spare pull string with every outlet installed.
20. Do not install cable in wet areas, or in proximity to hot water pipes and boilers.
21. Termination ends of cables shall be clean and free from crush marks, cuts, or kinks left from pulling operations. Installed cable jackets shall have no abrasions with exposed conductor insulation or bare copper "shiners". The contractor shall be responsible for replacing any damaged cables.
22. Backbone cables shall be installed and bundled separately from horizontal distribution cables. Backbone and horizontal cable bundles shall be loose and random.
23. Back bone cables spanning more than three floors shall be supported at the top of the cable run with wire mesh grip and on alternating floors unless otherwise specified by local codes or manufacturers guidelines.
24. Vertical runs of backbone cables entering each Telecommunications Room shall be securely fastened along a properly prepared wall in the room on each floor. Use of cable ladders is required.

C. Communications Infrastructure

1. Maximum cable lengths shall be 295 feet (90 m) including the service loop. Provide all necessary installation materials, tools and equipment.
2. Support and secure cables at patch panel using rear able management bracket, spools or management devise.
3. Cross-connects shall be completed as per the construction schedule.

D. Optical Fiber Cable
1. Inner-ducts of the proper rating shall be run between each closet.
2. Cables for direct burial, aerial, or other outside applications shall be designed specifically for the intended purpose.
3. All optical fiber shall be installed using open cabling methods. Limit cable-bending radius to 20 times the cable diameter during installation and 10 times the cable diameter after installation. Provide all required tools, materials, consumables, and equipment necessary for field mounting of LC connectors.
4. Do not exceed the maximum pull tension specified by the cable manufacturer. Use appropriate lubricants as required to reduce pulling friction. Avoid kinking and twisting of cables during installation.
5. Label both ends of each cable as to source and destination. Terminate optical fibers in a consistent and consecutive manner at each end. Place all material in inner-duct between label optical fiber raceway cable with yellow "CAUTION-OPTICAL FIBER CABLE" tags every 10 feet. Leave 10 feet of slack at each fiber termination point. Neatly coil slack optical fiber cable on top of rack above optical fiber patch panel enclosure at each rack location.
6. Optical fiber cable terminations shall utilize enclosures and components in quantities consistent with the required fiber counts at each end of each segment.
7. The contractor shall follow all of the connector manufacturer's recommendations and shall visually inspect all optical fiber connector terminations with a 200 or 400 power microscope for proper termination.
    a. an acceptable termination shall show a connector tip that is free of imperfections in 100% of the core and 80% of the cladding.
    b. Unacceptable termination flaws shall include but not be limited to; scratches, full or partial cracks, bubbles, pits, epoxy residue, dirt, dust, oil, moisture, grinding, and sanding debris.
    c. All unacceptable connectors shall be re-terminated and re-inspected at the contractor's expense.
8. During installation of optical fiber cable do not allow pulling tension to exceed cable manufacturer's specification for the cable being installed. Only the strength member of the cable shall be subjected to the pulling tension.
9. Clean all optical fiber connector tips prior to inserting them into matting receptacles or bulkheads. Install all dust covers.
10. Using approved methods, pull cable into conduit, place into raceway, or place into cable tray as specified. A pull cord (Nylon 1/8" minimum) shall be co-installed with all cable installed in any conduit.
11. Where cables are installed in an air return plenum riser rated cable shall be installed in metallic conduit.
12. Backbone and horizontal cables shall be installed and bundled separately in any pathway.
13. Cables above ceilings or below access floors shall be installed in cable trays or open-top cable hangers.

14. A service coil of at least 3 feet (1 m) is recommended within workstation outlets. At least 6 feet (2 m) is recommended for telecommunication enclosures. Main trunk and OSP cables shall also have a large diameter service coil in the specified location.
15. The recommended maximum spacing of cable supports above the ceiling is 5 feet.
16. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
17. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other approved structure to support the weight of the cable. Do not exceed maximum cable vertical rise limits.
18. Cables that are damaged during installation shall be replaced by the contractor.

E. Racks and Enclosures
1. Freestanding equipment racks and enclosures shall be protected of all dust, debris, and other environmental elements during construction until the punch list walk through.
2. Each rack or enclosure shall have a dedicated #6 AWG ground wire to a grounding busbar or building ground as defined by the NEC.
3. Secure racks and enclosures to the floor using the manufacturers rack installation kit.

F. Category 6 Jacks
1. Refer to specific manufacturer's guidelines for termination of jacks and dressing CAT6 cables inside wall outlets and surface housings. Due to the larger size of CAT6 cable service coils in outlet boxes and surface housings are not recommended.
2. Terminate all jacks according to manufacturer's instructions.
3. All jacks shall be wired using T568B.
4. The contractor shall maintain wiring pair twists as close as possible to the point of termination to assure 10G Base-T performance. Minimize the length of exposed pairs from the jacket to the IDC termination point during installation.
5. The length of wiring pair un-twist in each termination shall be less than 0.5 inches (13mm).
6. Jacks shall be properly mounted in plates, frames, or housings with dust caps fully installed over IDC contacts.
7. Horizontal cables extending from mounted jacks shall maintain a minimum bend radius of at least 4 times the cable diameter unless space is restricted. Note: refer to specific manufacturers recommendations for restricted cable bend radius.
8. Cable terminations shall minimize tensile or bending strain on the IDC contacts after assembly of the faceplate or housing to the wall outlet.

G. Category 6 Patch Panels
1. Properly mount patch panels into the designated rack, cabinet, or bracket locations with the #12-24 screws provided
2. Terminate cables behind the patch panel according to the manufacturer's installation instructions.
3. To insure proper performance the contractor shall maintain wiring pair twists as close as possible to the point of termination and minimize the length of exposed pairs from the jacket to the ICD termination point during installation.
4. The length of wiring pair un-twist in each termination shall be less than 0.5 inches (13 mm) and shall be kept to a minimum.
5. Each terminated and dressed cable shall be maintained perpendicular to the rear cover using the recommended cable management hardware.

6. Horizontal or backbone cables extending from the rear panel terminations shall maintain a minimum bend radius of at least 4 times the cable diameter.
7. Cable terminations shall have a minimal tensile or bending strain on panel IDC contacts in each installed location.
8. Panels shall be properly labeled on the front and back with the cable number and port connections for each port.

H. Harsh Environment Housing and Connectivity
1. Mount connector housing from the front of the device. Install gasket or optional protective cap before mounting connector housing into device.
2. Secure connector housing to device using supplied plastic nut. Tighten nut with 6-7 inch/pounds of torque.
3. Ensure that mounting surface is clean and free of debris.
4. Installing the jack into the mounted connector housing.
5. Install the terminated jack into the mounted connector housing by tilting the jack and securing the fixed latch in the connector opening. Rotate the jack securing the spring latch.
6. Clean and remove any obstructions from the surface that the wall plate assembly will be installed against.
7. Place washers provided with hi-impact series plates onto screws. Align rubber gasket on the back side of plate prior to installing to the box/wall by placing screws through plate and rubber gasket.
8. Secure the wall plate assembly to box/wall by tightening screws with 5 inch/pounds of torque.
9. Attach patch cords and field term plug assemblies (sold separately) to the mounted connector.

I. Optical fiber connectors, horizontal and backbone
1. Installed fiber connectors shall have proper cable support, routing, and strain relief.
2. The contractor shall inspect 100% of all installed connectors for polish quality and contamination.
3. Fusion splices for pigtail connections shall be protected in a suitable enclosure.

J. Grounding and bonding systems, basic guidelines
1. Telecommunications grounding and bonding system shall be installed in accordance with NEC requirements and per the guidelines of ANSI J-STD-607-A.
2. The telecommunications main grounding busbar (TMGB) shall be bonded to the building main electrical service ground (grounding electrode conductor or GEC) using approved lugs or exothermic weld methods. Bonding to the GEC or TMGB with sheet metal screws is prohibited.
3. the telecommunications bonding backbone shall be a minimum of #6 AWG copper wire conductor. A telecommunications grounding busbar (TGB) shall be installed in the Telecommunications Room on each floor, and call be bonded to the TBB. All metal racks, cabinets, pathways, and enclosures shall be bonded to the TGB.
4. Telecommunications equipment shall be grounded according to manufacturer's instructions and in accordance with all applicable codes.
5. All metallic pathways including conduit, raceway ladder, or cable trays shall be electrically continuous and shall be bonded to ground on each end.
6. OSP cable entering the building or backbone cables having metal sheaths shall have isolation protections. Isolation protectors shall be bonded to the TMGB.

3.5. LABELING

A. General
   1. All labels shall be permanent and machine generated by a labeling machine as follows:
      a. Labels shall be on a a permanent polyester material, clear in color.
      b. Lettering shall be black in color.
      c. Hand written labels will not be permitted.
   2. The Contractor shall coordinate the labeling scheme with the Owner prior to producing and installing any labels. The Contractor shall provide samples of finished installations at a pre-installation meeting with the Owner prior to completing the installation.
   3. Surfaces shall be cleaned before attaching labels. All labels shall be attached firmly and vertically plumb on equipment, faceplates, patch panels, termination blocks, etc.
   4. All labeling of cables, equipment, and components shall be included in as-built documentation, floor plan drawings, schematic designs, and test reports.

B. Cabling
   1. All structured cables (horizontal and backbone) shall be labeled at both ends within 6" of cable termination point. Where voice backbone cables extend behind termination blocks cable labels shall be placed at a location on the cable where the labels are visible from the front of the termination block.
   2. Labels shall have and adhesive backing and shall wrap completely around the circumference of the cable jacket. Label and lettering shall be of an appropriate size with regards to the cable diameter.

C. Equipment Racks, Termination Hardware, and Faceplates
   1. The Contractor shall coordinate the labeling scheme with the Owner prior to producing and installing any labels. The Contractor shall provide samples of finished installations at a pre-installation meeting with the Owner prior to completing the installation.

3.6. TESTING

A. Category 6 Cable Testing
   1. Permanent link testing shall be completed on all horizontal (station) cables. The Contractor shall be responsible for supplying a channel warranty but the Owner requires that the contractor supplies all the manufacturer's patch cords per the contract.
   2. CAT6 cabling systems shall be tested as an installed horizontal permanent link configuration. Jacks and faceplates shall be assembled, complete and properly mounted into outlet boxes. Panels shall be terminated complete and fully dressed with proper cable management.
   3. All CAT6 cables shall be properly labeled prior to testing. Test results shall be in numerical order by Cable ID.
   4. All wiring shall be certified to meet or exceed the specifications as set forth in TIA-568C for CAT6 requirements for permanent link. All tests shall be performed to 250 Mhz.
   5. Test results shall include the following information for each pair of each cable installed:
      a. Name of the person performing the test.
      b. Test equipment manufacturer and model number.
      c. Cable ID.
      d. Date of Test
      e. Wire map (pin to pin connectivity and polarity check)
      f. Length (in feet)

g. Insertion loss
h. Near end cross talk (Next)
i. Power sum near end crosstalk (PSNEXT)
j. Equal level far end crosstalk (ELFEXT)
k. Power sum equal level far end crosstalk (PSELFEXT)
l. Return loss
m. Delay skew
n. Attenuation to crosstalk ratio (ACR)

6. A "PASS" indication shall be obtained for each link using (at minimum) a level III tester that complies with TIA/EIA-568-B.2 field test requirements.
7. Correct all malfunctions and "FAIL" when detected and re-test to demonstrate compliance.
8. Record test results for each cable and provide to the General Contractor for the Owners review. All cables shall "PASS" as a condition of installation acceptance.

B. Optical Fiber Testing
1. Test procedures shall be as described by the following:
   a. TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard parts 2 and 3.
   b. TIA/EIA-526-14-A-1998 Optical Power Loss Measurements Of Installed Multi-mode Fiber Cable Plant-OFSTP-14A
2. Pre-installation Testing:
   a. Test each conductor of every optical fiber on the reel with a light source and power meter.
   b. Obtain the cable manufacturer's power meter test results for each reel used on the project.
   c. Record the readings and the manufacturers reel number on the attached Optical Fiber Test Form
   d. Provide completed forms, optical fiber reel tag IDs and cable manufacturer's test results to the Owner prior to installing cable.
3. Acceptance Testing:
   a. Each terminated fiber strand in the horizontal or backbone infrastructure shall be tested individually as a permanent link. A fiber permanent link is defined as the length of individual fiber strand with a connector terminated on each end.
   b. Testing for multi-mode shall be at 850 and 1300 nanometers. Total link insertion loss (DB) shall be within the specified link loss budget.
   c. Tier 1 testing for each installed single-mode link shall be performed as an optical power insertion loss measurement as defined by ANSI/TIA/EIA-526-7. Testing for single-mode shall be at 1310 and 1550 nanometers. Total link insertion loss (DB) shall be within the specified link loss budget.
   d. Tier 2 testing, if required, for each installed single-mode or multi-mode link shall be performed as an OTDR measurement as defined in TIA-TSB-140. The Owner requires Tier 2 testing on all fibers installed in this facility for future troubleshooting.
   e. Multi-mode optical fiber attenuation shall be tested on all individual fibers of each cable segment using an LED light source and power meter to determine the actual loss. These tests shall be performed at the 850 and 1300 nanometer windows in both directions. The test setup and performance shall be in accordance with ANSI/TIA/EIA-526-14-A, Method B.
   f. A reference power measurement shall be obtained by connecting on end of test jumper 1 to the light source and the other end to the power meter. After

recording the reference power measurement test jumper 1 shall be disconnected from the power meter without disturbing the light source and attached to the cable plant. The power meter shall be moved to the far end of the cable plant and attached to the cable plant with test jumper 2.

g. Readings must not be higher than the "Optimal Attenuation Loss" (OAL). The OAL shall be calculated using the actual installed lengths plus the manufacturer's best published attenuation losses for the connector and/or splice installed on this project (0.30+/-0.30 for connectors and 0.10 for splices). The Contractor shall use the OAL for comparison with the end to end power loss test results prior to acceptance.

h. Test results must be completed and turned over to the General contractor and the Owner prior to the contract punch list date. Specific due dates will be determined by the General Contractor.

3.7. CONTRACT CLOSEOUT REQUIREMENTS

A. Closeout Documentation. The Contractor shall assemble all closeout documentation required below and provide it digitally in a PDF, searchable (when applicable), format on a compact disc, thumb drive or other compatible digital device unless otherwise specified below. This documentation shall be kept separate from other similarly required documents and provided to the Owner's Information Technology representative for review and approval. The documentation shall be provided and indexed as follows:

1. Index of contents
2. Pre-installation test results, one complete set in approved format indicating all pre-installation tests met or exceeded the specification
3. Post-installation test results, one complete set in approved format showing all post installation terminations met or exceeded the specification
4. As-Builts
   a. The Contractor shall maintain through the construction process a paper set of as-built documentation. Upon completion of the installation and verification by the Owner and Design Engineer that all documentation is complete the contractor shall provide the Design Engineer with the paper plans for inclusion into a digital as-built design set.
   b. Complete floor plan as-builts shall indicate all of the following information:
      i. Include detailed information of cable and pathway layouts, locations of pull points/boxes, and other such products and equipment installed.
      ii. Locate all work station outlets, camera, locations and other such data drops; provide the correct alpha numeric cable assigned to each location.
      iii. Where product/equipment locations are dimensionally located provide the installed dimensions by either circling the design dimension if correct or providing the field correct dimension. Provide all dimensions for installations not originally dimensioned in the design.
      iv. Any deviation in location of an installation shall be noted on the drawings regardless of the reason for change. Items grossly not installed in their intended location shall be "X" out and drawn in the installed location
      v. Indicate all items added or deleted to the contract through change order or other such means. Provide the document number that caused the change.
   c. Provide complete details of final installation of all racks and equipment. Provide the alpha-numeric numbers (range low to high) assigned to each patch panel on a rack.

5. Operation and Maintenance information, all of the following items shall be grouped by like item for a specific product or piece of equipment.
    a. A complete set of all submittals
    b. A complete set of all installation instructions for products and equipment installed. Only one (1) copy of each product or piece of equipment needs to be supplied.
    c. A complete set of all operation instructions for products and equipment installed
    d. A complete set of all maintenance/care instructions for products and equipment installed
6. Warranty/guarantee Information
    a. Provide signed contractors warranty letter for installation and service for the period of one (1) year.
    b. Provide manufacturer's warranty/guarantee information for all products and equipment installed. Verify with all plans and specifications the required terms of warranties/guarantees. If none are specified provide the default manufacturer's warranty/guarantee.

B. Owner Training. The Contractor shall provide Owner Training as needed on all Division 27 installations. The contractor shall verify with the Owner's Information Technology representative as to what items will be trained, how much training will be necessary and coordinate training dates and times.

END OF SECTION

SECTION 27 21 33
WIRELESS ACCESS POINTS (WAP)

PART 1 – GENERAL

1.1. SCOPE

A. The work under this section is for the installation of OWNER PROVIDED, CONTRACTOR INSTALLED Wireless Access Points (WAP).
B. The WAPs shall be installed by the contractor providing and installing the Communications Cable and Equipment. All contractor qualifications and certifications for that section shall apply to this section.

1.2. RELATED SPECIFICATIONS

A. The Contractor shall be responsible for reviewing all other specifications for requirements associated with the complete installation of WAP's. This includes but is not limited to the following:
   1. 01 33 23 Submittals
   2. 27 00 05 Communications Cabling

1.3. SUBMITTALS

A. Contractor licenses and qualifications are required as part of the complete Division 27 submittal package as indicated under Specification 27 00 05.
B. No submittals are required for the owner provided WAP.
C. Submittals are required for installation/hanger equipment, connectors, and any other required equipment/material required for a complete WAP installation.

PART 2 - PRODUCTS

2.1. WIRELESS ACCESS POINT (WAP) DEVICES

A. The Owner's Information Technology Department will be providing the WAP devices for this project.
B. The WAP device being used will be as manufactured by the Cisco, Model 3700E and shall be used for all types of ceiling mounted installations (suspended, gyp board, open truss, etc).

PART 3 - EXECUTION

3.1. OWNER RESPONSIBILITIES

A. The Owner shall be responsible for ordering, making payment (including shipping fees), and configuring all WAP devices in a timely manner to comply with the Contractors schedule.
B. The Owner shall configure and test each WAP to Owner specifications prior to providing them to the contractor for installation.
C. The Owner shall number each WAP and provide the contractor with a location map indicating where each WAP will be installed.

C. The Owner shall test all WAP's after installation to verify configuration and signaling is correct prior to accepting the final installation of the WAP system.

3.2. CONTRACTORS RESPONSIBILITIES

A. The Contractor shall be solely responsible for coordinating with Owner the scheduling and receipt of all WAP devices with his/her installation schedule.
B. The Contractor shall inspect all WAP devices upon receipt for damage. Owner shall be notified immediately of any damage.
C. The Contractor shall provide all mounting hardware, blocking, and other items required for a complete installation to the manufacturers installation requirements.
D. The Contractor shall install all WAP devices per plans and specifications including cable connections.
E. The Contractor shall be responsible to pick up WAP devices from Owner and delivery to the jobsite.

3.3. FINAL TESTING

A. Contractor shall provide final testing of all WAP devices after installation is complete.
B. In the event any WAP device is not operating properly the contractor shall trouble shoot the installation and work with the Owner to determine if re-configuration of the device will be required.
C. The Owner shall be responsible for reconfiguring WAP's as needed after installation is complete. The contractor shall be responsible for verifying connections, cabling and connectivity of the installation is correct.

3.4. WARRANTY

A. The Owner will be responsible for registering any warranty information associated with the purchase and ownership of all WAP devices.
B. The Contractor shall warrant the installation of the WAP device for one (1) year per the terms of this contract.

END OF SECTION

SECTION 28 13 00
ACCESS CONTROL SYSTEM (CONTINENTAL)

PART 1 - GENERAL

1.1. SUMMARY

A. These specifications describe the materials, equipment, and installation requirements to install an integrated, computerized access control and alarm monitoring system utilized by the Owner's Information Technology Department.
B. The ACS System Contractor shall be responsible for verifying equipment requirements, locations, and coordination with the General Contractor and all other necessary trades as needed for a complete installation.

1.2. RELATED SPECIFICATIONS

A. 01 33 23 Submittals
B. 08 71 00 Door Hardware
C. 27 00 05 Communications Cabling

1.3. RELATED DRAWINGS

A. Refer to all Electrical drawings for locations of distribution panels and equipment as it relates to standard line voltage locations.
B. Refer to all Technical drawings for locations of Access Control System (Continental) equipment.
C. Refer to the door hardware schedule and Architectural floor plans for information relating to door access locations and specific hardware requirements.

1.4. REFERENCES

A. The system shall comply with the standards, codes and regulations of the following regulatory bodies:
    1. Underwriters Laboratories (UL) Std No. 294 – Access Control System Units
    2. Canadian Standards Association (CSA) Std C22.2 No. 205-M1983 – Signal Equipment
    3. CE Standards
        a. EN 55022 RF Emissions
        b. EN 55024 RF Immunity
        c. EN 60950-1 Equipment Safety
    4. FCC Subpart B – RF Emissions
    5. Industry Canada ICES 003 Emissions
    6. RoHS

1.5. CONTRACTORS

A. The Contractor installing the ACS system shall be:
    1. Gappa Security Solutions, 1203 Storbeck Drive, Waupun, WI. 53963

1.6. SUBMITTALS

A. The Contractor shall provide a complete submittal package in a timely manner to allow sufficient review time prior to ordering the system components required for a complete installation. The contractor shall be solely responsible for any equipment, purchased/ordered/delivered that is not approved of during the submittal review process.
B. The complete submittal package shall include but not be limited to the following:
    1. All certifications of the contractor and contractor's installation team. Certifications shall be current from the start of the contract through the end of the warranty period.
    2. Cut sheets indicating, shop drawings, performance data, and other such information that will indicate the component being installed matches the component that was specified.
    3. Cut sheets and shop drawing of Contractors recommendations for tags and labels.

1.7. WARRANTY

A. The Contractor shall warrant for one year the complete installation of equipment and components associated with this contract and installation. Contractors warranty shall be in the form of a written letter on company letterhead referring to the contract information, dates of installation and acceptance, signed by an authorized representative of the Contractors Company.
    1. The Contractors warranty shall include but not be limited to the following:
        a. Transportation to and from the location as often as needed during the warranty period.
        b. All labor and materials necessary to properly and thoroughly trouble shoot the system.
        c. All fees associated with the shipping of any component that needs to be returned or supplied by the manufacturer for repair or replacement.
        d. All labor and materials required to remove, repair, replace, or re-install any component.
B. The Contractor shall also provide all manufacturers warranties/guarantees associated with installed components of the completed installation.

1.8. QUALITY ASURANCE

A. The Contractor shall be responsible for coordinating his/her Work with other trades and divisions as needed for a complete installation. This shall include pre-installation meetings for locating equipment, conduit, cabling, control devices, and other materials and equipment required by this installation.
B. The General Contractor (GC) shall be responsible for ensuring that all doors requiring controlled access are properly prepared and installed per the contract documents. The GC shall further be responsible for ensuring all project coordination, pre-installation meetings, submittals and other such project management responsibilities are conducted efficiently and according to the project specifications and schedules.

PART 2 - PRODUCTS

2.1. EXISTING SYSTEM PRODUCTS OVERVIEW

A. The Owner's Information Technology Department owns and operates a fully licensed copy of the Continental Access Control System software.

1. The Continental Access Control System (ACS) provides controlled access to secured doors and elevators through the use of electronic door latches, proximity readers, control panels, and a proprietary software program.
2. The Continental software allows the Owner to customize multiple levels of access and system performance through any combination of the following:
    a. Calendar and time based lock/unlock controls
    b. Group access control for common personnel groups
    c. Individual access control for specialized access control
    d. Elevator access control for accessing/not accessing various floors
    e. Temporarily disable access control for a specified time period
    f. Remotely unlock/lock a door
    g. Lockdown a facility from one location
    h. Provide customizable alert notifications

2.2. NEW EQUIPMENT AND COMPONENTS

A. The Contractor guarantees that all equipment and components shall be furnished new, undamaged, free of defects, and conform to the drawings and specifications of this contract. The contractor is solely responsible for replacing any damaged or defective item.
B. New ACS components on interior and exterior access doors shall be able to be integrated with the Owners existing system.

PART 3 - EXECUTION

3.1. COOPERATION OF THE ACS CONTRACTOR

A. The Contractor shall be required to coordinate with all trades for a complete and timely installation. This includes attending all pre-installation meetings where equipment locations, conduit locations, and control devices will be installed or may be in conflict with the installation of other trades. The Contractor shall be solely responsible for any additional cost required for removing/replacing/modifying any completed work by other trades because the installation was not properly coordinated.
B. The Contractor shall coordinate with the Owners Representative for all information necessary to complete the installation and integration with the Owners existing hardware and software.
C. The Contractor shall verify with the appropriate Owners Representative for mounting heights of all hardware and equipment prior to installation. This shall be completed at a pre-installation walk through prior to rough-in.
D. The Contractor shall coordinate with the elevator equipment installer the location and wiring of the EFACP.
E. The Contractor shall coordinate with the Owner's Representative IT to verify all requirements for all access controlled doors are properly coordinated and understood prior to roughing in the installation.

3.2. GENERAL EQUIPMENT MOUNTING

A. All ACS equipment shall be mounted to the 3/4" AC fire rated plywood panels provided and installed by the General Contractor. Contractor shall tape out all equipment prior to mounting to insure adequate space is allotted for the complete installation per the riser diagrams including all related conduits and cables.
B. The EFACP shall be mounted to the 3/4" AC fire rated plywood panels provided and installed by the General contractor in the elevator Equipment Room. The General Contractor

shall coordinate the location of the plywood panels with the Elevator Equipment Contractor and the ACS Contractor prior to installation.

C. All equipment shall be neatly arranged so as to meet or exceed the manufacturer's recommended working space around each component.

D. Equipment to be installed on plywood mounting panels shall include but not be limited to the following:
   1. Distribution Service Panel (AC-DS-1)
   2. Power Supply Panel (AC-PS-1)
   3. Access Control Panel (AC-SEC-1)
   4. Elevator Control Panel (EFACP), including transformers
   5. All required conduits, and boxes for line voltage

3.3. GENERAL CONDUITS AND WIRING

A. This section shall apply to both the ACS Contractor and the Electrical Contractor. The following division of responsibilities shall apply:
   1. The Electrical Contractor shall be responsible for furnishing, installing, and connecting all conduits, connectors, conductors, and other related materials associated with providing line voltage to the ACS system as follows:
      a. Providing an 110V, 15A, dedicated circuit from the designated distribution panel to AC-DS-1 as described in Section 2.3 above.
      b. Providing line voltage from AC-DS-1 to AC-PS-1 as described in Section 2.4 above.
      c. Providing and installing the required 110V, 20A dedicated duplex outlet in the elevator Equipment Room (B11). Coordinate the location with the ACS Contractor and the Elevator Contractor.
   2. The ACS Contractor shall be responsible for furnishing installing, and connecting all conduits, connectors, conductors and other related materials required to complete the installation of the low voltage wiring and door controller cabling.

B. All conduits shall be properly sized for the number of wires or wire bundles being pulled through the conduit. The Contractor shall verify with the manufacturer the recommended fill rate by conduit size and shall not exceed the recommendations.

C. The contractor shall neatly lay out all conduits in such a fashion so as to minimize bending, crossovers, etc.

D. Bends, pull boxes, and pull points shall be sized and located as per all applicable codes and standards for the number of wires or wire bundles in the bend, pull box, pull point.

E. CAT6 cables from each AC-SEC-1 and the EFACP shall be neatly run in cable management equipment supplied and installed by the cabling contractor or conduits supplied and installed by the ACS Contractor as needed. The switch to be used for all ACS equipment shall be located in Telecom Room #507H. Cables shall be labeled on both ends per the cabling specification.

F. The General Contractor and the ACS Contractor shall ensure the following Emergency Access requirements are properly installed and operational prior to the final Madison Fire Department inspection for occupancy.
   1. Owner shall provide a minimum of six (6) swipe cards to each installed Knox Box for emergency entrance. The cards shall be appropriately coded for entry at all controlled access doors.
   2. The following doors shall be wired to unlock in the event of an emergency.
      a. Existing Stair A #STAIR-A.

3.4. EQUIPMENT IDENTIFICATION AND LABLEING

A. The Contractor shall provide and install all equipment identification and labeling to the following specifications.
   1. Tags and labels shall be permanent rigid plastic or metal tags with engraved or machine stamped lettering. Hand written self stick or metal hand stamped tags will not be accepted.
   2. The Contractor shall work out the labeling scheme for doors with IT, Owner, and Architect prior to ordering any labels or tags.
   3. The Contractor shall provide all labels and tags associated with this specification. This shall include the line voltage feed to each AC-DS-1 from the electrical distribution panel.

B. Panels and Boxes
   1. All panels and boxes shall be labeled on the outside cover that readily identifies the panel/box as a “Distribution Supply”, “Power Supply”, “Access Control Panel”, “Elevator Floor Access Control Panel”, etc. An associated number shall also be on each tag and the number “1” shall be used even if there is only one of that type panel/box.
   2. Access Control Panels shall have a card index inside the front cover of each door indicating the controller number, door number, and door location being served by that panel.

C. Conduits
   1. Line voltage from electrical distribution panels shall have conduits labeled on both ends as follows:
      a. At the distribution panel the line voltage conduit shall be labeled with the system supplied, and the ACS distribution supply panel number.
      b. In the Telecommunications Room the line voltage conduit label shall indicate the distribution panel and circuit number(s) controlling the supply line.
   2. Conduits between Access Control Panels and the controlled doors shall be labeled on both ends as follows:
      a. In the Telecommunications Room each conduit shall labeled with the door number(s) being supplied.
      b. Above the finished ceiling where the conduit is exposed prior to going into the wall space that serves the door the conduit shall be labeled with the Door Control Panel and Controller number associated with the door being served.
      c. If the conduit size is reduced as control cabling is supplied to doors along the run each change is conduit size shall be re-labeled as noted in 2.b. above.
   3. Conduits between equipment and components in the Telecommunications Room do not need to be identified.

3.5. INSTALLATION TESTING AND ACCEPTANCE

A. The Owner shall be responsible for completing all software programming associated with the installation of this contract prior to the completion of the installation of the system components. It is the sole responsibility of the Contractor to notify the Owner no less than two (2) weeks in advance of completing the installation that all codes and time setting shall be prepared for final installation and testing.

B. The Contractor and the Owner shall test each access control point with swipe cards and PINs to insure the door unlocks.

C. Owner shall test each door using the existing fully integrated software. This shall include but not be limited to the following:

1. Remotely lock/unlock the doors
2. Verify time clock feature works for locking doors
3. Verify swipe cards and PINs work on all doors
4. Verify emergency entrance cards for knox boxes work on all doors for the areas served.

D. The Contractor and the Owner shall test the elevator floor access functions as follows:
   1. With swipe cards and PINs to ensure controlled access to all floors.
   2. With no swipe cards or PINs to ensure that the general public can only access the designated public floors and not controlled access floors.
   3. Verify time clock feature works for accessing floors

E. A completed and accepted installation shall pass all of the above tests for all controlled access points.

F. The warranty period for the completed and accepted installation shall not begin until the date of the accepted general contract. The Contractor shall coordinate this date with the General Contractor.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the new Fire Alarm System as shown on the drawings and as herein specified.

B. Included are the following topics:
   1. Part 1 – General
      a. Scope
      b. Related Work
      c. Description of Work
      d. Regulatory Requirements
      e. Manufacturer Provided Services
      f. Quality Assurance
      g. Qualifications
      h. Submittals
      i. Department of Safety & Professional Services Plan Review
      j. City of Madison Fire Department Inspection/Permit
      k. Project Record Drawings
      l. Operation and Maintenance Data
      m. Product Delivery, Storage and Handling
      n. Spare Parts
      o. Supervision
      p. Power Requirements
   2. Part 2 – Products
      a. Existing Fire Alarm Control Panel
      b. Operation - Existing Fire Alarm System
      c. Remote Annunciator - FAAP
      d. NAC Booster Panels
      e. Multiplex/Intelligent Peripheral devices
      f. Audio Visual Notification Appliances
   3. Part 3 – Execution
      a. General
      b. Raceways
      c. Conductors
      d. Device Mounting
      e. Identification
      f. Testing
      g. Warranty
      h. Special Considerations

1.2 RELATED WORK

A. The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under the following project sections:

B. Section 26 05 00 - Common Work Results for Electrical

C. Section 26 05 02 - Electrical Demolition

D. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cable

E. Section 26 05 26 – Grounding and Bonding for Electrical Systems

F. Section 26 05 29 – Hangers and Supports for Electrical Systems

G. Section 26 05 33 – Raceway and Boxes for Electrical Systems

H. Section 26 05 53 – Identifications for Electrical Systems

I. Section 26 27 26 – Wiring Devices

1.3 DESCRIPTION OF WORK

A. The project consists of a renovation of the Fourth Floor of the City County Building in Madison, Wisconsin. Extend the existing Simplex #4100U system throughout the remodeled areas of the building as shown on the plans.

B. This system does not require the ALERT strobes. All references to ALERT equipment and functions in these specifications shall be ignored.

C. The complete installation shall be done in a neat, workmanlike manner in accordance with the applicable requirements of NFPA 70 - Article 760 and the manufacturer's recommendations.
   1. Signaling Line Circuits (SLCs), connecting addressable field points to the associated Fire Alarm Control Panel, shall be configured as NFPA style 4 (Class B), with point supervision.
      a. Floors with more than 25 Addressable Devices shall be split into isolated SLC sub-circuits where each circuit shall not have more 25 devices. Where this is done, the floor shall be "split" along a logical, physical boundary.
   2. Network Connections, Data, Audio, and Signaling Line Circuits, which functionally link together multiple panels or Transponders shall be wired in an NFPA Style 6 (Class A) arrangement.
   3. Initiating Device Circuits (IDCs) shall be limited to short runs from Monitor Modules to the connected device, unless specifically stated otherwise herein, and shall be configured as NFPA Style B (Class B), with individual zone supervision.
   4. Notification Appliance Circuits (NACs) shall be configured as NFPA Style Y (Class "B").
   5. Data Circuits to Annunciators shall be configured as NFPA Style 4 (Class "B"). All annunciators shall be fully supervised.

1.4 REGULATORY REQUIREMENTS

A. The complete installation shall conform to the applicable sections of the latest edition of the following Codes and Standards:
   1. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):
   2. NFPA 70 National Electrical Code (NEC) generally, and Article 760 in particular
   3. NFPA-72 National Fire Alarm Code

4. NFPA 101 Life Safety Code
5. IBC International Building Code
6. IFC International Fire Code
7. IMC International Mechanical Code

B. Madison Fire Department.

C. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

D. UNDERWRITERS' LABORATORIES, INC. (UL)
1. UL-864 Control Units for Fire Protective Signaling Systems
2. UL-268 Smoke Detector for Fire Protective Signaling Systems
3. UL-217 Smoke Detectors for Single and Multiple Stations
4. UL-521 Heat Detectors for Fire Protective Signaling Systems
5. UL-464 Audible Signaling Appliances
6. UL-1971 Visual Signaling Appliances
7. UL-38 Manually Actuated Signaling Boxes
8. UL-1481 Power Supplies for Fire Protective Signaling Systems

1.5 MANUFACTURER PROVIDED SERVICES

A. A manufacturer-trained service technician shall provide the following installation supervision. This Technician shall be certified by the equipment manufacturer and shall have had a minimum of two (2) years of service experience in the fire alarm industry.

B. The technician's name shall appear on equipment submittals and a letter of certification from the fire alarm manufacturer shall be sent to the project engineer. The manufacturer's service technician shall be responsible for the following items:

C. Pre installation visit to the job site to review equipment submittals and verify method by which the system should be wired.

D. Periodic job site visits to verify installation and wiring of system, and to perform any partial system programming – required to permit portions of the existing system to be removed.

E. Upon completion of wiring, final connections shall be made under the supervision of this technician, and final checkout and certification of the system.

F. At the time of final checkout, technician shall give operational instructions to the Owner and/or his representative on the system.

G. All job site visits shall be dated and documented in writing and signed by the Electrical Contractor. Any discrepancy shall be noted on this document and a copy kept in the system job folder that shall be available to the Project Engineer any time during the project.

1.6 QUALITY ASSURANCE

A. Unless specifically stated otherwise, each and all items of the fire alarm system shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the UL label.

B. Notification Appliances may be products of a single, different manufacturer – provided that the Primary Equipment Provider or Manufacturer provides written documentation of compatibility, and agrees to assume any and all responsibility for compatibility with the Control Equipment.

C. In addition to previously listed UL standards, all control equipment shall be listed under the following UL Standards:
   1. UOJZ UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.
   2. UL 864 Transient protection
   3. UL 497B Isolated Loop Circuit Protectors. Where fire alarm circuits leave the building, additional Transient protection must be provided for each circuit.
   4. UL 1481 Power Limited Applications.

1.7 QUALIFICATIONS

A. All equipment shall be supplied by a firm, which specializes in fire alarm and smoke detection systems with a minimum of five (5) years-documented experience. The company shall be an authorized distributor of the proposed equipment

B. All work shall be performed by a licensed contractor, who is regularly engaged in the installation and servicing of fire alarm systems. Proof of five (5) years documented experience and of factory authorization to furnish and install the equipment proposed shall be furnished prior to contract award, if required by Division of Facilities Development.

C. Contractor shall be located within three (3) hours of travel time or less from the site of this project.

1.8 SUBMITTALS

A. Under the provisions of Section 26 05 00 and Division 1, submit the following for approval prior to ordering any equipment in accordance with requirements of Division 1, General Conditions. Submit a total of ten (10) sets.

B. Copies of CAD Files (AutoCAD, latest version) for the Fire Alarm floor plans will be made available to the successful bidder for preparation of the required shop drawings and as-builts REQUIRED SUBMITTAL MATERIALS

C. The following items, and any additional items required per Section 26 05 00, shall be included within the submittal package:

D. Although they may be submitted under separate cover, Submittal Brochures / Booklets / Binders and Shop Drawings shall be submitted together and shall be treated as a complete set.

E. COVER SHEET:
   1. The submittals shall contain a cover sheet, which shall include the following information:
      a. Submittal Date
      b. Specification Section(s)
      c. Electrical Contractor (Contact Name, name, address, and telephone number)
      d. Project Name, Project City, Project State, and Project Address.

F. TABS AND TABLE OF CONTENTS:
   1. The Table of Contents shall appear immediately behind the Cover Sheet and shall contain a complete listing of all of the tabs contained within the binder / booklet.
   2. Tabbed index sheets shall be inserted into each of the binders, such that each binder is clearly sub-divided into sections. Tabbed sections shall be provided, at minimum, for the following:
   3. One section for each building – All submittal data, which applies to any particular building, shall be located within the tabbed section for the corresponding building. All submittal data within each "building" section shall appear in the same order.
   4. One section for manufacturer's data sheets – divided into sub-sections for the following:
      a. Panel Equipment (Panels, Panel Components / Modules, Printers, Annunciators, etc.)
      b. Addressable Field Devices (Initiating and Control / Monitoring / Isolation)
      c. Non-Addressable Field Devices (Initiating Devices, relays, etc.)
      d. Notification Appliances
      e. Fire-Fighter Communications Equipment if applicable

G. EQUIPMENT LIST:
   1. A complete equipment list of all components, including the following: Quantity, Manufacturer, Part Number, and Description. If the supplier uses different part numbers from those of the actual manufacturer, the actual manufacturer and part numbers as they appear – marked on the shipping box / packages, shall also be identified on this list.
      a. Each Equipment List shall include a complete listing of the modules, components, and software included for each modular FIRE Alarm Control Panel, Network Panel, Transponder, Outboard Gear Panel or Annunciator. Such items shall be listed in a manner that clearly indicates that such items are parts of / components of a larger unit. Simply stating a single part number and description for such panels shall be unacceptable.
      b. A separate list shall be included for each section, with items grouped by system.
      c. For projects involving multiple systems, separate equipment lists shall be provided - one for each system.
      d. Spare Parts shall also be listed separately and shall be identified clearly as "Spare Equipment".

H. PRODUCT DATA:
   1. Manufacturer's product data sheets, and equipment description of all system components. These data sheets shall be highlighted or suitably marked, so that included items and options are indicated. On data sheets that include multiple products, products that are not used shall be crossed out.
   2. Product Data Sheets shall be organized, in order, corresponding to the first occurrence of the corresponding item on the equipment list.

I. SEQUENCE OF OPERATION:
   1. Complete sequence of operations of all functions of the system. This sequence of operation shall be custom-created for this particular job.
   2. In order to satisfy this submittal requirement, it shall be acceptable to include copies of the "Operation" portions of the specifications, including any applicable schedules / other supplementary information. Copied specification pages shall be marked and highlighted, where the programmed operation will differ from the specified operation. Copied specification pages shall be marked "no changes", where no significant deviation will

occur. Other acceptable alternatives shall include written narratives, organized in a logical manner, and Matrix Charts.

3. Where Matrix Charts are provided, such charts shall be organized and labeled clearly, and shall incorporate suitable levels of detail (refer to NFPA-72 (2007) A.10.6.2.3(9) for an example of an acceptable matrix chart). The Leftmost column of the Matrix Chart shall include groupings of initiating devices and other function switches. The Topmost Row shall include groupings of notification appliances and output devices.

J. BATTERY CALCULATIONS:
   1. These calculations shall clearly illustrate both the Standby and Alarm loads, due to the various field devices and panel components / modules. It is generally recommended to submit such calculations in a "spreadsheet" format. These calculations shall include any reserve / additional capacity, as required elsewhere within these specifications. Final results shall indicate both the minimum battery capacity required and the capacity actually provided.

K. ADDRESSABLE DEVICE / DESCRIPTOR LIST - Prior to programming the system, submit a chart or printout, listing every system address provided for purposes of alarm initiation, status monitoring, supervised signaling, and auxiliary controls. This printout shall include the corresponding device type and field programmable "custom labels", as they will be displayed on the New System – at the FACP and Local Annunciator. The addresses listed within this document shall directly correspond to the addresses marked on the submitted floor plan drawings. This list will be modified as needed by the Owner and returned to the contractor for final programming in to the system.

L. NAC WIRE DROP CALCULATIONS:
   1. Calculations shall be provided for all Notification Appliance Circuits (NAC) in the building. It is recommended that this calculation should follow a "spreadsheet" format, and should clearly indicate the following:
      a. The name of the circuit
      b. Point of origin of the circuit
      c. Complete list of all devices served by the circuit, including location and type of each device
      d. Alarm Current Draw for each device, at the applied voltage
      e. Applied Voltage (Based on anticipated battery voltage after specified stand-by & alarm operation)
      f. Acceptable Operating Voltage for each type of device on circuit
      g. Calculated Voltage at each device on circuit

M. These calculations should mathematically prove that all Notification Appliances on the circuit will receive acceptable power for proper operation, under "worst-case-scenario" conditions.

N. SHOP DRAWINGS:
   1. All submitted drawings shall be created using AutoCAD, and shall be coordinated so that terminal numbering, circuit designation and equipment or device designations are the same on all drawings. All drawings must be submitted and approved by the engineer before ordering or fabrication starts, but such approval will not waive any specification requirements unless specifically stated. City of Madison shall provide copies of the floor plan drawings, in AutoCAD, to the successful bidder.
   2. Each and every sheet of the Shop Drawings shall be clearly and prominently identified as "SHOP DRAWINGS – PREPARED BY: (insert name of contractor firm preparing the

shop drawings)". The name and company logo for the Electrical Contractor should be added to the title block in each sheet, and a revision date shall be inserted on each sheet.

3. The submitted Shop Drawings shall include the following types of drawings:
   a. PROJECT-SPECIFIC DRAWINGS:
      1) Project-Specific Drawings. These drawings shall include the following:
   b. SYSTEM RISER DRAWING:
      1) A separate riser drawing shall be furnished for each system. Each System Riser shall illustrate all fire alarm circuits, which serve the facility, and shall incorporate the following information, in a clear, concise format:
         a) Point of origin of each circuit (usually a Panel, or a Module within a panel)
         b) Circuit type and labeling
         c) Area served by each circuit
         d) Wire / cable type and size
         e) Locations of Panelboards where primary system power is obtained
         f) The following information for each Field Device:
         g) Device Type
         h) Circuit(s) to which device is connected
         i) Locations of any End-Of-Line Resistor (EOLR)
         j) (and the circuit terminated by any such EOLR)
   c. BLOCK DIAGRAMS:
      1) Showing layout and operation of the entire system.
   d. FLOOR PLANS:
      1) These drawings shall consist of edited versions of the Contract Documents, which shall include the following information:
         a) Fire Department Response Location(s)
         b) Annunciator Location(s)
         c) Panel Location(s)
         d) Device Addresses - The addresses shown on these drawings shall directly correspond to the chart or printout, as specified previously, which spells out specific information about each device, including the field programmable "custom label".
   e. TYPICAL DEVICE / MODULE WIRING DETAILS:
      1) Component and module wiring diagrams – intended to illustrate terminations and wiring connections to each typical Field Device (Detectors, Notification Appliances, etc.), and each typical panel component / module utilized within the system. This set of drawings shall only include diagrams for modules and components, which are actually used in the provided system(s).
      2) These drawings shall incorporate clear labeling / nomenclature, which shall clearly indicate the corresponding field device or module, to which it corresponds.

O. OMISSION OF ANY OF THE ABOVE MATERIALS FROM THE SUBMITTALS SHALL RESULT IN AN IMMEDIATE REJECTION OF THE SUBMITTALS FOR THIS PROJECT. If the Contractor has any questions concerning the preparation of these materials, please contact the Engineer.

1.9 MADISON FIRE DEPARTMENT PLAN REVIEW

A. This project requires a submittal to the MADISON FIRE DEPARTMENT for review and approval. The following details the requirements of the contractor and the A/E with regards to the fire alarm submittal. Coordinate all requirements with the Madison Fire Department.

B. PLAN REVIEW FEES
   1. As required by the Madison Fire Department.

C. WHAT TO SUBMIT
   1. As required by the Madison Fire Department.

1.10 CITY OF MADISON – FIRE DEPARTMENT INSPECTION / FIRE ALARM WORK PERMIT

A. PER A LOCAL ORDINANCE (City of Madison General Ordinance 34 – Fire Prevention Code) EFFECTIVE AS OF JULY 2, 2002 - THE FIRE ALARM AND FIRE PROTECTION SYSTEMS, AS INSTALLED WITHIN THIS FACILITY ARE SUBJECT TO PERMIT REQUIREMENTS AND INSPECTIONS OF THE INSTALLATION BY THE CITY OF MADISON – FIRE DEPARTMENT / FIRE PREVENTION BUREAU.

B. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SCHEDULING, COORDINATING, AND ATTENDING THIS INSPECTION, AND FOR PAYMENT OF ALL ASSOCIATED INSPECTION / PERMIT FEES.

C. This process normally involves both a plan review and inspections; however, for State-Owned Buildings, the City of Madison only performs the inspections, with the Plan Review being performed by DSPS as specified previously under “Submittals”.

D. Copies of the applicable Code can be obtained on-line, via the following link:

E. http://www.cityofmadison.com/sites/default/files/city-of-madison/fire/documents/MGOchapter34.pdf

F. Because of this Permit / Inspection process, the following procedure shall be followed by the Electrical Contractor, (and by their sub-contractors, where particular arrangements have been made between the EC and their sub-contractor(s)):

G. First, the Electrical Contractor shall obtain State-Approval of the Installation Drawings, per the process previously described under “Submittals – Plan Review Process”, as found within this specification.

H. Once the State-Approved Drawings are received by the contractor, and PRIOR TO STARTING ANY CONSTRUCTION, the Electrical Contractor shall completely fill-out submit the proper “City of Madison Fire Department – Fire Protection System Work Permit Application” form. If required, suitable fee payment shall accompany the form. Copies of this form may be obtained via the following link:

I. http://www.cityofmadison.com/sites/default/files/city-of-madison/fire/documents/workpermitapp.pdf

J. Once the form has been received, processed, and accepted by the Madison Fire Department (MFD), MFD will issue the proper permit, and construction may begin.

K. The inspection program involves at least two inspections, as follows:

L. A Rough-In Inspection shall be scheduled and performed, prior to installation of any new devices. In certain buildings (high-rises), multiple rough-in inspections may be required, as

subsequent areas are completed. It is highly recommended that these inspections should be carefully scheduled and adhered to, since potentially costly mistakes can be prevented before the associated devices are completely installed.

M. Final Inspection of the System – prior to this inspection, the Electrical Contractor shall have conducted all necessary pre-testing.

N. Questions regarding this inspection program may be directed to:

City of Madison Fire Department
314 W Dayton St
Madison, WI 53703
Phone: (608) 266-4420
Fax: (608) 267-1153
fire@cityofmadison.com

1.11 PROJECT RECORD DRAWINGS

A. Installing Electrical Contractor shall submit to the Architect/Engineer for approval the as-built drawings for the entire work done under this project prior to final payment.

B. Work shall be done on AutoCAD using the contract drawings provided to the Contractor by City of Madison in the form of AutoCAD files. A hard copy of same shall also be submitted.

C. These drawings shall show:
1. Locations and addresses of Initiation Devices, Notification Appliances, isolation devices, status-monitoring devices, supervised signaling devices, and auxiliary control devices. All these devices shall be shown as connected to system wiring.
2. Circuit and Address information for each field device listed above.
3. Conduit layout.
4. Number/size/type of conductors in each conduit run
5. Riser diagrams
6. Location of end-of-line devices

D. Riser diagrams shall be specific for this project, and shall include location of emergency 120VAC panel, panel designation and circuit number used to feed each fire alarm panel. Also, indicate if panel is backed up by an emergency generator.

E. Riser diagrams shall include locations (room or area number) of notification, initiating, end-of-line devices and addresses for all addressable field devices.

F. Also see requirements in Division 1, General Conditions.

1.12 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. A material guide, which shall contain the replacement part numbers and description of all components used. If this information is included in an instruction section for any of the equipment, it will not be necessary to duplicate the list. In either case, the parts list shall be associated with its respective chassis, modules or kit wherein it is found. A total listing of parts without such grouping will not be acceptable.
2. Catalog data or literature
3. Manufacturer's operating instructions
4. Manufacturer's maintenance instructions
5. Installation instructions
6. Name, address and telephone number of source for parts (i.e. keys, guards, etc) not supplied by the Fire Alarm Manufacturer
7. Copies of all approved shop drawings
8. An updated copy of the submitted sequence of operation, revised to reflect any implemented changes

1.13 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Receive equipment at job site; verify applicable components and quantity delivered.

B. Handle equipment to prevent internal components' damage and breakage, as well as denting and scoring of enclosure finish.

C. Do not install damaged equipment.

D. Store equipment in a clean, dry space and protect from dirt, fumes, water, and construction debris and physical damage. Make arrangements with the Owner at the pre-construction meeting for storage of equipment on the premises

1.14 SPARE PARTS

A. Contractor shall provide the following spare parts in quantities shown:

Quantity:	Type of Device
(1)	Photoelectric smoke detectors
(1)	Smoke and heat detector bases – “standard” 2-Wire Type
(1)	Wall mounted multi-candela Horn/strobe Units
(1)	Ceiling mounted multi-candela Horn/strobe Units

1.15 SUPERVISION

A. The system shall report a TROUBLE condition when any supervised circuit becomes disarranged, disconnected, or is manually disabled or overridden. Each supervised circuit shall be independently protected for short-circuit conditions, and shall be arranged so that faults on any one circuit do not prevent the proper operation of any other circuit in the system.

B. The following devices/circuits shall be supervised, as a minimum:
1. ALL communications links.
2. ALL Signaling Line Circuits
3. ALL Initiating Device Circuits.
4. All sprinkler flow and tamper switches.
5. ALL Notification Appliance Circuits.
6. Auxiliary manual control circuits.

7. Manual control switches for off normal position
8. Remote Control Relays / Control Modules.
9. Primary, AC Incoming power to the system.
10. The system's batteries.
11. System Expansion Modules
12. Auxiliary module LED's.

C. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

D. Each independently supervised circuit shall include a discrete LCD readout, to indicate disarrangement conditions per circuit.

1.16 POWER REQUIREMENTS

A. Primary 120 VAC power, to all Fire Alarm equipment shall consist of dedicated branch circuits. These circuits shall be of a 3-conductor type, including a suitably sized green ground wire – SHARED NEUTRALS AND CONDUIT GROUNDS SHALL BE UNACCEPTABLE.

B. All fire alarm power supplies, as well as any other supplemental power supplies, shall be installed in compliance with NFPA-70 – National Electrical Code (Latest Edition).

C. All external circuits requiring system-operating power shall be 24VDC and shall be individually supervised and fused at the control panel.

PART 2 PRODUCTS

2.1 EXISTING FIRE ALARM CONROL PANEL

A. The existing panel is a Simplex #4100U panel.

2.2 OPERATION: EXISTING FIRE ALARM SYSTEM

A. Maintain the existing system operation.

2.3 REMOTE ANNUNCIATOR - FAAP

A. Existing FAAP to remain.

2.4 NAC BOOSTER PANELS (Remote Power Supplies):

A. Where they are used, “NAC Power Booster Panels” shall be individually supervised. Interconnecting NAC Booster Panels in a manner, which prevents identification of individual panel TROUBLE conditions, shall not be approved. NAC Booster Panels shall be wired to dedicated Emergency Power Branch Circuits where available.

B. If NAC Booster Panels are needed at locations other than those identified on the construction drawings, the Electrical Contractor shall obtain approval for their proposed installation locations. At such locations, the EC shall provide any required circuit breakers, associated power wiring, and local smoke detection at the approved location. Power shall be obtained

from the nearest available emergency panel. The cost of such equipment and installation shall be included within the base Electrical Bid.

2.5 MULTIPLEX/INTELLIGENT PERIPHERAL DEVICES

A. All devices shall be supervised for trouble conditions. The system control panel shall be capable of displaying the type of trouble condition (open, short, device missing/failed). Failure of a device shall not hinder the operation of other system devices.

2.6 DEVICE IDENTIFICATION

A. Each intelligent device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address shall not be acceptable.

B. Device addressing schemes which use permanently-imbedded, electronically-identifiable "serial number" which is similar to the address imbedded within Personal Computer Network Interface Cards shall be acceptable.

C. Fire Alarm Systems utilizing hand-held or briefcase-style programming tools, which are used to electronically assign addresses and/or programming parameters to devices shall be acceptable. However, one such programmer tool shall be provided to the Owner at no additional cost.

D. The address along with the loop number and end-of-line device if present shall be indicated, and be visible from the ground, on the device in the field using machine generated marking. Contractor shall provide a sample of such labeling scheme before using it.

E. End-of Line devices shall also be identified by means of permanent, machine generated label, affixed to the device.

F. Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t tapping and the addition of an intelligent device between existing devices requires re-programming all existing devices beyond added device.

G. The system must verify that proper type device is in place and matches the desired software configuration.

2.7 INTELLIGENT DETECTORS - GENERAL

A. Smoke and heat detectors must be approved by the Madison Fire Department.

B. Each detector shall incorporate the following features:

C. LED(s), which shall flash to indicate communication with the Fire Alarm System, and which also illuminate in a steady manner when the detector is in an alarm status

D. A means to allow field function testing of the detector

E. A low-profile design / shape

F. An insect screen

G. Voltage and RF transient suppression techniques, in order to minimize false alarms

H. Smoke detectors shall communicate the actual smoke chamber values to the system control panel.

I. Smoke detectors shall be listed for sensitivity testing from the control panel. Sensitivity test results shall be logged and downloaded to a printer.

J. The detectors shall be plug-in units, which mount to a common base, and shall be UL 268 approved.

K. Each detector shall be compatible with the fire alarm panel and shall obtain its operating power from the SLC, to which it is connected. (Where relay or sounder-equipped bases are used, it shall be acceptable to require a separate 24 VDC or NAC connection.) Each detector shall be reset by actuating the control panel reset switch.

L. If field conditions so require the smoke detection devices shall not be installed until the construction is completed.

2.8 INTELLIGENT DETECTOR BASES

A. Bases shall be suitable for either smoke or heat detector mounting.

B. Either the base or the head shall contain electronic circuits that communicate the detector's status (normal, alarm, sensitivity status, trouble, etc.) to the control panel over two wires. The same two wires shall also provide power to the base and detector. Contacts between the base and head shall be of the bifurcated type using spring-type, self-wiping contacts.

C. The base shall be lockable. The locking feature must be field-removable when not required.

D. Upon removal of the detector's head, a trouble signal shall be transmitted to the control panel.

E. The detector base shall be sealed against rear airflow entry.

F. Each detector's base or head shall contain LED(s), which shall flash when the detector is being scanned by the control panel. The LED(s) shall turn on steady when the detector is in an alarm condition.

2.9 INTELLIGENT PHOTOELECTRIC SMOKE DETECTORS

A. The detectors shall contain no radioactive material.

B. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle using a pulsed infrared LED light.

2.10 FAULT ISOLATOR MODULE (FIM)

A. The system shall employ Fault Isolator Modules (FIM) on the Signaling Line Circuits. These FIM units shall be utilized in order to isolate portions of SLCs, in the event of short circuit conditions. The SLC segment protected by each FIM shall be separated from the SLC in a manner such that a single short-circuit condition may not affect more than 25 Addressable Field Devices / Detectors, which are served by the isolated SLC segment.

B. The FIM shall be located as close as practical to the point where the isolated SLC sub-circuit branches, and shall also be located at an accessible location.

2.11 DOOR HOLDERS

A. Magnetic door holders shall have an approximate holding force of 25 Ibs (minimum) (recommended 35 lbs.)

B. The door portion shall have a stainless steel pivotal mounted armature with shock absorbing nylon bearing.

C. Unit shall be capable of being either surface, flush, or semi-flush mounted as required.

D. Power for 24 v dc door holders shall be independent and separate from the main power supply of the fire alarm panel.

2.12 AUDIO VISUAL NOTIFICATION APPLIANCES

A. HORN/STROBES

B. Horns shall have vandal resistant metal or Lexan white housing or grills. Horns shall be polarized, and shall be compatible with the 24 VDC NACs provided by the control panel and/or NAC Booster Panels/Supervised Control Modules. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit.

C. Horns shall be UL listed to provide a minimum sound pressure level of 93 dB at 10 feet, per UL Standard 464.

PART 3 EXECUTION

3.1 GENERAL

A. The complete installation shall be done in a neat, workmanlike manner in accordance with the applicable requirements of NFPA 70 - Article 760 and the manufacturer's recommendations.

B. Smoke detectors shall not be mounted until the construction is completed, unless they are covered with plastic bags or fitted covers immediately after installation to maintain cleanliness.

3.2 RACEWAYS

A. NOTE: ALL FIRE ALARM SYSTEM WIRING SHALL BE INSTALLED WITHIN METALLIC CONDUIT UNLESS SPECIFIED OTHERWISE.

B. All wiring shall be in a conduit system separate from other building wiring. See Section 26 05 33 – Raceway and Boxes for Electrical Systems for specifications.

C. All wiring shall be in minimum ½" steel raceway, unless free-air wiring is approved by City of Madison.

D. 40% fill factor shall be applied to all conduit sizes.

E. The contractor shall size conduit and boxes by circular mil size of each cable in each conduit or box. The circular mil sizing can be found on the manufacture's spec sheet, then use the NEC codebook to make calculation to follow NEC Chapter 9 Tables and Annex C for box and conduit fill.

F. The contractor is encouraged to use red conduit for fire alarm systems.

G. There shall be no sharp edges with installed materials.

H. Use only identified conduit entries or request approval for other penetrations in cabinets; (certain areas require clear space for interior components / batteries). Cabinet shall be grounded to either a cold water pipe or grounding rod.

I. Existing conduit and surface metal raceway that is ½" in size or larger may be reused if found to have adequate space provided that it only serves the fire Alarm system and doesn't contain any AC wiring. All existing conduit that is reused MUST be brought up to the current State of Wisconsin Electrical Code and Approved for usage by the Engineer prior to work being done.

3.3 CONDUCTORS

A. All wire and cable associated with this system shall be as required by the equipment manufacturer. The following information is intended for estimating purposes only. However, the minimum wire gauges and colors specified shall be strictly adhered to. All cable shall be installed as per NEC Article 760.

B. Type FPL wiring is required if the system is run in conduit or 'free-air.

C. All initiation and notification circuit cabling shall be listed Type FPL (300V) in accordance with NEC article 760."

D. All cables and wires #14 AWG and larger shall be stranded.

E. Fire alarm wiring shall be held in place at the device box, by means of a two-screw connector, (do not use squeeze or crimp type connectors).

F. All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, any open circuits or grounds in the system, an audible and visual trouble signal shall be activated until the system is restored to normal.

G. All conductors shall be color-coded. Coding shall be consistent throughout the facility. Green wire shall be used only for equipment ground.

H. Leave 8-inch wire tails at each device box.

I. Cable for Intelligent detector Loops shall be 18 to 12 AWG twisted pair with a shield jacket or per manufacturers recommendations installed in ½" conduit. Shield continuity must be maintained and connected to earth ground only at the control panel.

J. SLC wiring must not be in the same conduit with AC power wiring or other high current circuits. T-taps or branch circuit connections are allowed for all class B SLCs.

K. All splices or connections shall be made within approved junction boxes and with approved fittings. Boxes shall be red and labeled "FIRE ALARM SYSTEM" or “FA” by decal or other approved markings.

L. Horn and strobe circuits shall have separate conductors, and shall operate independently of each other.

M. Strobe wiring shall be #14 AWG minimum.

N. Tray cable is not acceptable for use as fire alarm system wiring installed in conduit.

3.4 DEVICE MOUNTING

A. Unless otherwise noted on the drawings, plans, specifications or by the Architect or Engineer; the recommended mounting heights, and requirements are as follows:

3.5 VISUAL AND AUDIO / VISUAL NOTIFICATION APPLIANCES

A. In Public-Mode Areas, as defined within NFPA-72, install flush, semi-flush or surface between 80 inches and 96 inches or 6 inches below finished ceiling or at 80 inches from the bottom of the device to the highest level of the finished floor. No devices protruding 4 inches or more shall be installed lower than 80 inches. If these requirements are not achievable, consult with the Engineer before installation.

B. Audio/visual devices may be installed on the ceilings only where indicated, or where approved in writing by the Engineer. (In such cases, these devices shall be installed in accordance with current NFPA 72 standards). Audio/visual devices installed on ceilings shall have white grills

C. Except as noted in the previous paragraph, all audio/visual devices shall be wall-mounted at the same height throughout the facility.

D. Strobes spacing shall be in accordance with NFPA 72.

E. For surface mounting, use manufacture-supplied back boxes and trim plates, which shall be painted Red or off White, and shall contain no visible conduit knock-outs. Mark each device with its circuit number.

3.6 HEAT AND SMOKE DETECTORS

A. The location of detectors shown on the plans is schematic only. The detectors must be located according to code requirements.

B. Surface mounted detectors shall be installed using back boxes equal to the base’s size. Standard octagon and square boxes are not acceptable.

C. Detectors should be located on the highest part of a smooth ceiling so that the edge of the detector is no closer than 4 inches from a sidewall. Ceilings with beams, joists or soffits that exceed 8 inches in depth require special planning and closer spacing.

D. If it is necessary to mount a detector upon a sidewall, the top of the detector (the sensing chamber portion of the device) shall be located no closer than 4 inches from the ceiling and no further away than 12 inches.

E. Smoke detectors should be installed to favor the air flow towards return openings and not located closer than 3 feet from air supply diffusers which could dilute smoke before it reaches the detector. No detectors shall be installed in direct airflow.

F. Heat and smoke detectors should be located near the center of the open area which they are protecting, thus providing coverage generally for 15-foot radius for heat and smoke detectors. Questionable locations shall be verified with Architect or Engineer before installation takes place.

G. Heat and smoke detectors / Sensors – both Intelligent and non-addressable, shall be installed in accordance with their UL Listed Spacing. The quantity of Heat and smoke detectors / Sensors depicted on the drawings is based on the 900 square foot per detector rule. If detectors with significantly different spacing requirements are selected by the fire Alarm equipment provider / Contractor, then additional detectors / sensors, if required, shall be provided at no additional cost to the project.

3.7 IDENTIFICATION

A. Attach the label containing the address and SLC designation to:
   1. Each addressable detector. Label shall be visible and readable from the floor, 3/16" minimum character size (¼" is recommended).
   2. Each manual pull station. Label shall be placed on the top part
   3. Each Addressable Module. Label shall be attached to the faceplate

B. Label shall consist of black writing on white or clear background.

C. All fire alarm boxes shall be painted red and labeled "Fire Alarm" or "FA". When red conduit is used for the fire alarm system installation, there is no need to paint the boxes. Non-factory device boxes shall also be painted red.

D. All circuits must be labeled with the name of circuit and the area being served by the circuit.

E. Wire/cable splices in junction boxes shall be labeled indicating where the wire/cable is coming from and where it is going.

F. All conductors terminated in control panels, annunciator panels and extension panels shall be labeled.

G. All audio-visual devices shall be labeled by each circuit and the order of the device on that circuit such as "Circuit No. 2, strobe No. 05 of 10".

H. All labels shall be permanent, and be machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS SHALL BE ALLOWED. Submit a sample for approval before using any labeling schemes.

I. Label size shall be appropriate for the conductor or cable size(s) and design. All labels to be used shall be self-laminating, white/transparent vinyl and be wrapped around the cable (sheath). Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.

J. Adhesive type labels not permitted except for phase and wire identification.

3.8 TESTING

A. Before proceeding with any testing, all persons, facilities and building occupants whom receive alarms or trouble signals shall be notified by the contractor to prevent unnecessary response or building occupant distress. At the conclusion of testing, those previously notified shall be notified that testing has been concluded.

B. The manufacturer's authorized representative shall provide on-site supervision of installation of the complete fire alarm system installation, perform a complete functional test of the system, and submit a written report to the Contractor attesting to the proper operation of the completed system prior to final inspection.

C. Contractor shall pre-test each and every device in the system before the system is considered ready for final inspection.

D. The completed and pre-tested fire alarm system shall be fully tested in accordance with NFPA-72 by the Contractor in the presence of the Engineer, City of Madison representative, Owner's representative and the local Fire Marshal.

E. The Engineer or his authorized representative may suspend or discontinue the tests at any time performance is considered unsatisfactory. Resumption of testing will cover untested elements and any replaced elements. The contractor shall furnish all test personnel, test instruments and equipment of the accuracy necessary to perform the test. Arrangements for testing must be made with the City of Madison representative and the Engineer at least two weeks before the proposed testing date.

F. Upon the completion of a successful test, and prior to the final request for payment the Contractor shall:
   1. Certify the system to the Owner in writing
   2. Complete the NFPA 72 record of completion form
   3. Provide as builts and O&M manuals.
   4. Provide a signed statement that the Owner had received the specified system operation and maintenance training

G. The final payment will not be processed unless these documents are complete and are on hand.

3.9 WARRANTY

A. The Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of two (2) years from the date of substantial completion of the project.

B. At the end of the project, the Contractor shall post the warranty period along with the company’s name and telephone number inside the fire alarm panel.

C. Any occupied facility shall not be without a UL and an NFPA approved and fully operational fire alarm system for a period longer than two (2) hours. Emergency response shall be provided within two (2) hours of the notification, to the contractor, of the failure of the system

to perform operationally per UL and NFPA standards. Non-emergency service calls shall be responded to within twenty-four (24) hours of the notification to the contractor.

D. Emergency situations may include, but not limited to
   1. System can't be acknowledged or reset
   2. System is non-responsive to commands
   3. System in non-responsive to actuated alarm devices
   4. Malfunction of notification/initiating circuit(s)
   5. System going into alarm/trouble without indicating the source
   6. System is dead (no power), etc.

E. Repairs and/or replacement arising from emergency situations shall be completed within twenty-four (24) hours of the time of notification. Other than emergency, actual repairs and /or replacement shall be provided within seventy two (72) hours of the time of notification during normal working hours, Monday through Friday, excluding holidays. If the repairs involve parts that are not shelve items and require lead time, the contractor shall inform the Owner within twenty-four (24) hours from the time of notification of the exact time when the repairs will be completed.

F. If repair and/or replacement cannot be made within the prescribed time, then other means and methods of protection shall be provided to insure the safety of the building's occupants during which time the system is not in compliance with the standards. This may involve up to and include hiring Owner approved qualified personnel to stand a fire watch, all at the contractor's expense.

G. Warranty service for the equipment shall be provided by the system supplier's factory trained representative. Further, Warranty shall include all parts, labor and necessary travel.

3.10 SPECIAL CONSIDERATIONS

A. Contractor shall refer to Division 1, General Requirements, "SPECIAL SITE CONDITIONS".

B. The contractor must maintain the existing fire alarm system operational during the construction period. During periods of construction where dust or dirt may contaminate the existing detectors, the contractor shall cover the detectors to avoid nuisance alarms and trouble-calls.

C. Individual zones and/or devices of the existing fire alarm system can be bypassed by the contractor during construction under the following requirements:
   1. The Superintendent of Buildings and Grounds is notified of which zones and/or devices are inoperative and for how long in writing, hand delivered.
   2. The contractor covers all manual-pull stations that are not active and post temporary fire alarm notification procedures next to each inactive manual-pull station.
   3. Ensure the fire alarm system is fully operational before leaving the job site.

END OF SECTION