

RFB NO. 317015



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. 317015 LIBRARY SERVICE RENOVATION 1880 SOUTH STOUGHTON ROAD MADISON, WISCONSIN

Due Date / Time: **TUESDAY, MAY 2, 2017 / 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:

ROB NEBEL- ASSISTANT PUBLIC WORKS DIRECTOR or ERIC URTES, AIA- PROJECT MANAGER

TELEPHONE NO.: 608/267-0119 (ROB) or 608/266-4798 (ERIC)

FAX NO.: 608/267-1533

E-MAIL: NEBEL@COUNTYOFDANE.COM or URTES.ERIC@COUNTYOFDANE.COM

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Plot drawings 24" x 36" (ARCH D)paper for correct scale or size.

GENERAL

G100 COVER SHEET, INDEX OF DRAWINGS AND SYMBOLS &
ABBREVIATIONS

CIVIL

C200 SITE PLAN AND DETAILS

DEMOLITION

D200 FIRST FLOOR DEMOLITION PLAN

ARCHITECTURAL

A200 FIRST FLOOR PLAN AND EXTERIOR IMPROVEMENTS

A300 REFLECTED CEILING PLAN

A700 INTERIOR ELEVATIONS, PARTITION TYPES, DETAILS AND DOOR
SCHEDULE

A900 FINISH PLAN AND ILLUSTRATIVE FURNITURE PLAN

PLUMBING

PD101 FIRST FLOOR PLUMBING DEMOLITION PLAN

P100 FIRST FLOOR PLUMBING PLAN

FIRE PROTECTION

FP100 FIRST FLOOR FIRE PROTECTION PLAN

HVAC

M100 HVAC PLAN - DEMOLITION

M101 HVAC NEW WORK PLAN

M102 MECHANICAL ROOM PLAN, HVAC SCHEDULES AND DETAILS

ELECTRICAL

E000 SYMBOLS, ABBREVIATIONS AND INDEX SHEET

E100 LIGHTING PLAN

E200 POWER AND SYSTEMS PLAN

E300 ROOF PLAN

E400 ELECTRICAL RISER

E500 ELECTRICAL SCHEDULES

E600 ELECTRICAL DETAILS

LEGAL NOTICE

INVITATION TO BID

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

2:00 P.M., TUESDAY, MAY 2, 2017

REQUEST FOR BIDS NO. 317015

LIBRARY SERVICE RENOVATION

1880 SOUTH STOUGHTON ROAD MADISON, WISCONSIN

Dane County is inviting Bids for construction services for the remodeling of the former Blooming Grove Fire Department into a space that will serve the personnel and storage needs of the Library Service and Emergency Management. Work includes the interior renovation of the 3,750 SF office portion of the building with minor alterations to the garage and exterior. Only firms with capabilities, experience & expertise with similar projects should obtain this Request for Bids document & submit Bids.

Request for Bids document may be obtained after **2:00 p.m. on April 11, 2017** by downloading it from countyofdane.com/pwbids. Please call Rob Nebel, Assistant Public Works Director, at 608/267-0119 or Eric Urtes, AIA - Project Manager, at 608/266-4798, or our office at 608/266-4018, for any questions or additional information.

All Bidders must be a registered vendor with Dane County & pay an annual registration fee & must be pre-qualified as a Best Value Contractor before award of Contract. Complete Vendor Registration Form at danepurchasing.com/Account/Login? or obtain one by calling 608/266-4131. Complete Pre-qualification Application for Contractors at countyofdane.com/pwht/BVC_Application.aspx or obtain one by calling 608/266-4029.

A pre-bid facility tour will be held Thursday April 20, 2017 at 10:00 a.m. at 1880 South Stoughton Road. Bidders are strongly encouraged to attend this tour.

PUBLISH: APRIL 11 & 18, 2017 - WISCONSIN STATE JOURNAL
APRIL 11 & 18, 2017 - THE DAILY REPORTER



DANE COUNTY DEPARTMENT of PUBLIC WORKS, HIGHWAY and TRANSPORTATION

County Executive
Joseph T. Parisi

1919 Alliant Energy Center Way ♦ Madison, Wisconsin 53713
Phone: (608) 266-4018 ♦ FAX: (608) 267-1533

Commissioner / Director
Gerald J. Mandli

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 possess 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: <input type="checkbox"/> No: <input type="checkbox"/>
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: <input type="checkbox"/> No: <input type="checkbox"/>
3	Will your firm meet all bonding requirements as required by applicable law or contract specifications?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
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: <input type="checkbox"/> No: <input type="checkbox"/>
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: <input type="checkbox"/> No: <input type="checkbox"/>
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: <input type="checkbox"/> No: <input type="checkbox"/>
7	Will your firm fully abide by the equal opportunity and affirmative action requirements of all applicable laws, including County ordinances?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
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: <input type="checkbox"/> No: <input type="checkbox"/> 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: <input type="checkbox"/> No: <input type="checkbox"/> 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: <input type="checkbox"/> No: <input type="checkbox"/> If Yes, attach details.
11	In the past three (3) years, has your firm defaulted or failed to complete any contract?	Yes: <input type="checkbox"/> No: <input type="checkbox"/> 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: <input type="checkbox"/> No: <input type="checkbox"/> 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: <input type="checkbox"/> No: <input type="checkbox"/> If Yes, attach details.
14	Is your firm Executive Order 108 precertified with the State of Wisconsin?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
15	Is your firm an active Wisconsin Trade Trainer as determined by the Wisconsin Bureau of Apprenticeship Standards?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
16	Is your firm exempt from being pre-qualified with Dane County?	Yes: <input type="checkbox"/> No: <input type="checkbox"/> 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: <input type="checkbox"/> No: <input type="checkbox"/>
18	Contractor has been in business less than one year?	Yes: <input type="checkbox"/> No: <input type="checkbox"/>
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: <input type="checkbox"/> No: <input type="checkbox"/>
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 Jan Neitzel Knox 608-266-4029).	Yes: <input type="checkbox"/> No: <input type="checkbox"/>

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

Date

Printed or Typed Name and Title

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

REMEMBER!

Return all to forms and attachments, or questions to:

JAN NEITZEL KNOX
EMAIL: NEITZEL-KNOX@COUNTYOFDANE.COM
OFFICE: (608)266-4029, FAX: (608)267-1533

**DANE COUNTY DEPARTMENT OF PUBLIC WORKS,
HIGHWAY & 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

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 Thursday, April 20, 2017 at 10:00 a.m. at 1880 South Stoughton Road, Madison, WI. 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 Contract, are enumerated in Document Index of these Construction Documents.

- B. Complete sets of Drawings and Specifications are available on the Dane County website for download.

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 and supplies list of no more than three (3) most recent, similar projects, with architect or engineer's and owner's names, addresses and telephone numbers for each project. Submit to Public Works Project Engineer with Bid on separate sheets of paper. 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 Engineer 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 Engineer or designee all such information and data for this purpose as County's Public Works Project Engineer 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 a 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. Bidder shall carefully read requests for Alternate Bids, and thoroughly examine Drawings and Specifications to determine extent various changes and conditions will affect Bid.
- B. Space is provided in Bid Form for requested Alternate Bids. Failure to submit bid for any requested Alternate Bids may result in rejection of entire Bid.
- C. Bidder shall state amount to be added / subtracted to Base Bid for providing alternates, including all incidentals, omissions, additions, and adjustments as may be necessary or required by such changes. If there is no difference in price, Bidder shall state, "No Change".
- D. Descriptions of requested Alternate Bids are as set forth in Construction Documents.

16. INFORMATIONAL BIDS

- A. Bidder shall state amount that is included in Base Bid for all equipment, materials and labor required to complete the Work described. Informational bids are amounts requested for accounting purposes and for allocation of funds only. It is not intended to omit any of the Work described or related items from this project.
- B. Description of requested Informational Bids, if any, is as set forth in Construction Documents.

17. UNIT PRICES

- A. Provide unit prices where requested on Bid Form. Unit prices will include all costs for materials, labor, insurance, taxes, overhead and profit necessary to perform specified work. Estimated quantities are approximate only. Payment will be based upon actual quantities placed, provided or installed. Failure to provide requested unit prices may result in rejection of entire Bid.
- B. Owner reserves right to accept or reject any unit prices as given in Bid.
- C. Bidder shall refer to Bid Form and applicable specification section to determine basis of unit measure and detailed information related to each unit price item requested.

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. Not Applicable.

20. 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

Page ___ of ___

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

Page ___ of ___

**DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CONTACTS**

(Copy this Form as necessary to provide complete information)

COMPANY NAME: _____

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

	<u>ESB FIRM NAME CONTACTED</u>	<u>DATE</u>	<u>PERSON CONTACTED</u>	<u>DID ESB BID?</u>	<u>ACC- EPT BID?</u>	<u>REASON FOR REJECTION</u>
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

Name of Bidding Firm: _____

BID FORM

BID NO. 317015

PROJECT: LIBRARY SERVICE RENOVATION

**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 the former Blooming Grove Fire Department into a space that will serve the personnel and storage needs of the Library Service and Emergency Management. Work includes the interior renovation of the 3,750 SF office portion of the building with minor alterations to the garage and exterior. 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

Total: \$ _____
Numeric Price

_____ and _____ /100 Dollars
Written Price

LUMP SUM COST – INFORMATIONAL ONLY:

For book keeping purposes the Owner needs to identify the cost of the complete Photovoltaic (PV) system; all of which is included in the Base Bid.

\$ _____

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

Addendum No(s). _____ through _____

Dated _____

Dane County Division of Public Works must have substantial completion on this project done by September 1, 2017. Assuming this Work can be started by June 13, 2017, 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 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: _____

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
 Project Experience / Reference Summary – Provide 3 Projects/ References on separate sheets

BIDDERS SHOULD BE AWARE OF THE FOLLOWING:

DANE COUNTY VENDOR REGISTRATION PROGRAM

Any person bidding on any County contract must be registered with the Dane County Purchasing Division & pay an annual registration fee. A contract will not be awarded to an unregistered vendor. Obtain a *Vendor Registration Form* by calling 608/266-4131 or complete a new form or renewal online at:
www.danepurchasing.com/registration

DANE COUNTY BEST VALUE CONTRACTING PRE-QUALIFICATION

Contractors must be pre-qualified as a Best Value Contractor with the Dane County Public Works Engineering Division before the award of contract. Obtain a *Best Value Contracting Application* by calling 608/266-4018 or complete one online at:
www.countyofdane.com/pwht/BVC_Application.aspx

EQUAL BENEFITS REQUIREMENT

By submitting a Bid, the contractor acknowledges that a condition of this contract is to provide equal benefits as required by Dane County Code of Ordinances Chapter 25.016. Contractor shall provide equal benefits as required by that Ordinance to all required employees during the term of the contract. Equal Benefits Compliance Payment Certification shall be submitted with final pay request. For more information:
www.danepurchasing.com/partner_benefit.aspx

COUNTY OF DANE

PUBLIC WORKS CONSTRUCTION CONTRACT

Contract No. _____ Bid No. 317015

Authority: 2017 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

WITNESSETH:

WHEREAS, COUNTY, whose address is c/o Assistant Public Works Director, 1919 Alliant Energy Center Way, Madison, WI 53713, desires to have CONTRACTOR provide Library Service Renovations at 1880 ("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 Dorschner Associates, Inc. (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.
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 comply with provisions of Chapter 25.016 of the Dane County Code of Ordinances, which pertains to domestic partnership benefits.

7. 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.

8. CONTRACTOR agrees that all persons employed by CONTRACTOR or any subcontractor shall be paid no less than the minimum wage established under Chapter 40, Subchapter II, Dane County Code of Ordinances. CONTRACTOR agrees to abide by and comply with the provisions of Chapter 40, Subchapter II of the Dane County Code of Ordinances, and said Subchapter is fully incorporated herein by reference.

9. 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.

10. 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.

11. 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 Assistant 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 _____

_____	(Contractor as Principal)	_____	(Seal)
(Witness)	_____	_____	(Title)
_____	(Surety)	_____	(Seal)
(Witness)	_____	_____	(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.

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

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name _____
and Title: _____

Signature: _____

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:

Sample

(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: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

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)

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 18

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name _____
and Title: _____

Signature: _____

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:)

§ 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

Company: _____

(Corporate Seal)

SURETY

Company: _____

(Corporate Seal)

Signature: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

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.

EQUAL BENEFITS COMPLIANCE PAYMENT CERTIFICATION FORM

PURPOSE

25.016(8) of the Dane County Ordinance requires that each contractor receiving payment for contracted services must certify that he or she has complied fully with the requirements of Chapter 25.016 “Equal Benefits Requirement” of the Dane County Ordinances. Such certification must be submitted prior to the final payment on the contract.

This form should be included with a copy of the final contract invoice forwarded to your contract representative at Dane County.

CERTIFICATION

I, _____ certify that
Printed or Typed Name and Title

Printed or Typed Name of Contractor

has complied fully with the requirements of Chapter 25.016 of the Dane County Ordinances “Equal Benefits Requirements”.

Signed _____

Date _____

For questions on this form, please contact Chuck Hicklin at 608-266-4109 or your contract representative at Dane County.

GENERAL CONDITIONS OF CONTRACT

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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 time 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 shall pay all Sales, Consumer, Use and other similar taxes required by law.
- 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. Submit Equal Benefits Compliance Payment Certification with final pay request. Payment may be denied if Certification is not included.
- 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. If Wisconsin Prevailing Wage Rate Determination is required for this Work, use "Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination" and "Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination" (if applicable). If Wisconsin Prevailing Wage Rate Determination is not required for this Work, use "Dane County, Wisconsin Contractor Wage Affidavit". Forms of such affidavits are included in Supplementary Conditions.

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 (5th) 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 warranties 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 not 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. Contractor agrees to provide same economic benefits to all of its employees with domestic partners as it does to employees with spouses, or cash equivalent if such benefit cannot reasonably be provided. Contractor agrees to make available for County inspection Contractor's payroll records relating to employees providing services on or under this Contract or subcontract. If any payroll records of Contractor contain any false, misleading or fraudulent information, or if Contractor fails to comply with provisions of Chapter 25.016, Dane County Ordinances, contract compliance officer may withhold payments on Contract; terminate, cancel or suspend Contract in whole or in part; or, after due process hearing, deny Contractor right to participate in bidding on future County contracts for period of one year after first violation is found and for period of three years after second or subsequent violation is found.

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 lists 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.
- E. Submit required affidavit(s) to Department of Public Works, Highway & Transportation, as requested and with final application for payment for work under said contract. Affidavit(s) shall clearly indicate name, trade or occupation, and paid wages of every laborer, worker or mechanic employed by Contractor and all subcontractors during billing period including accurate record of number of hours worked by each employee and actual wages paid as stipulated in Wisconsin Statute 66.0903. If Wisconsin Prevailing Wage Rate Determination is required for this Work, use "Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination" and "Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination" (if applicable). If Wisconsin Prevailing Wage Rate Determination is not required for this Work, use "Dane County, Wisconsin Contractor Wage Affidavit". Forms of such affidavits are included in Supplementary Conditions.

48. CLAIMS

- A. No claim may be made until Department's Assistant 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 than \$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 \$500,000 or less. Therefore, if project completed value is more than \$500,000, 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.

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 Public Works Project Manager for approval.


AIA Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:	PROJECT:	APPLICATION NO:	Distribution to:
		PERIOD TO:	OWNER <input type="checkbox"/>
		CONTRACT FOR:	ARCHITECT <input type="checkbox"/>
FROM CONTRACTOR:	VIA ARCHITECT:	CONTRACT DATE:	CONTRACTOR <input type="checkbox"/>
		PROJECT NOS:	FIELD <input type="checkbox"/>
			OTHER <input type="checkbox"/>

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)

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: _____

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

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 G702™ – 1992, Copyright © 1963, 1963, 1965, 1971, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org. 010711A0204

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 ITEM NO.	B DESCRIPTION OF WORK	C SCHEDULED VALUE	D WORK COMPLETED		F MATERIALS PRESENTLY STORED <i>(Not in D or E)</i>	G TOTAL COMPLETED AND STORED TO DATE <i>(D+E-F)</i>	H BALANCE TO FINISH <i>(C-G)</i>	I RETAINAGE <i>(if variable rate)</i>
			FROM PREVIOUS APPLICATION <i>(D-E)</i>	THIS PERIOD				
<div style="font-size: 48px; opacity: 0.2; pointer-events: none;">Sample</div>								
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.

AIA Document G703™ – 1992. Copyright © 1963, 1965, 1966, 1967, 1970, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org. 10-1204504

2. CONTRACTOR WAGE AFFIDAVIT

- A. 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 in form as hereinafter set forth in this section. Affidavit affirms that all persons employed by contractor or by any of contractor's subcontractors on such contract have been paid no less than minimum wages established under Dane County Ordinances, Chapter 40, Subchapter II (Minimum Wage Ordinance) and in effect at date of execution of contract, that full payment of wages earned has been made, and that no rebates either directly or indirectly have been made. Form of such affidavit is included in this section.
- B. Form should be included with a copy of the final contract invoice forwarded to your contract representative at Dane County.

SECTION 01 00 00
BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SECTION SUMMARY

- A. Section Includes:
1. Section 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. Submittal Procedures
 12. Proposed Products List
 13. Shop Drawings
 14. Product Data
 15. Samples
 16. Manufacturers' Instructions
 17. Manufacturers' Certificates
 18. Quality Assurance / Quality Control of Installation
 19. References
 20. Interior Enclosures
 21. Protection of Installed Work
 22. Parking
 23. Staging Areas
 24. Occupancy During Construction and Conduct of Work
 25. Protection
 26. Progress Cleaning
 27. Products
 28. Transportation, Handling, Storage and Protection
 29. Product Options
 30. Substitutions
 31. Starting Systems
 32. Demonstration and Instructions
 33. Contract Closeout Procedures
 34. Final Cleaning
 35. Adjusting
 36. Operation and Maintenance Data
 37. Spare Parts and Maintenance Materials
 38. 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 the former Blooming Grove Fire Department into a space that will serve the personnel and storage needs of the Library Service and Emergency Management. Work includes the interior renovation of the 3,750 SF office portion of the building with minor alterations to the garage and exterior.
- B. Work by Owner: Not applicable.
- C. Permits: Prior to commencement of the Work, Contractor to secure any and all necessary permits for completion of the Work and facility occupancy.
- D. Diggers Hotline:
 - 1. It is General Contractor's responsibility to contact Diggers Hotline to have all utility locations marked prior to excavation and planning an excavation in a timely manner so as not to delay the Work.
 - 2. Diggers Hotline shall also be used to obtain information on safe working clearances from overhead lines.
 - 3. Completely comply with all requirements of each affected utility company.
 - 4. It is General Contractor's responsibility to contact & hire private utility locating services if necessary.

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 two (2) 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 Public Works Project Manager for approval & processing 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. Public Works Project Engineer may choose to videotape site or workers as the Work progresses.

1.8 CUTTING AND PATCHING

- A. Employ a 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. There will be pre-bid conference for this project; see Instructions to Bidders.
- B. Owner will schedule a pre-construction 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 a 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 minimum of one (1) per week with Public Works Project Engineer and A/E.
- B. Preside at meetings, record minutes, and distribute copies within two (2) business days to those affected by decisions made.

1.11 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.

1.12 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.

1.13 SHOP DRAWINGS

- A. Submit number of copies that Contractor requires, plus three (3) copies that shall be retained by Public Works Project Manager.

1.14 PRODUCT DATA

- A. Submit number of copies that Contractor requires, plus two (2) copies 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.

1.15 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.

1.16 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.

1.17 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.

1.18 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.

1.19 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.

1.20 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.

1.21 PROTECTION OF INSTALLED WORK

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

1.22 PARKING

- A. Arrange for temporary parking areas to accommodate construction personnel. Parking shall be available at the Work site.

1.23 STAGING AREAS

- A. Coordinate on-site 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.

1.24 OCCUPANCY DURING CONSTRUCTION AND CONDUCT OF WORK

- A. Areas of existing facility will be occupied during period when the Work is in progress. Work may be done during normal business hours (7:30 am to 5:00 pm), but confer with Owner, schedule work and store materials so as to interfere as little as possible with normal use of premises. 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.
- B. 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.
- C. Contractor shall, at all times, provide approved, safe walkways and facility entrances for use by Owner, employees and public.
- D. Contractor shall provide adequate protection for all parts of facility, its contents and occupants wherever the Work under this Contract is to be performed.
- E. Contractor [is, is not] responsible for providing & maintaining temporary toilet facilities.
- F. 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.
- G. 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.

1.25 PROTECTION

- A. Contractor shall protect from injury all trees, shrubs, hedges, walks and driveways and pay for any damage to same resulting from insufficient or improper protection.

1.26 PROGRESS CLEANING

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

1.27 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.

1.28 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

1.29 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.
- 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 be considered. Owner reserves right to approve or reject substitutions based on Specification requirements and intended use.

1.30 SUBSTITUTIONS

- A. Public Works Project Manager shall consider requests for Substitutions only within fifteen (15) calendar days after date of Public Works Construction Contract.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Construction Documents.

- C. Submit three (3) copies 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.

1.31 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.

1.32 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 videotape demonstration session; demonstration and demonstrator shall be to level of satisfaction of Owner.

1.33 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.

1.34 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.

1.35 ADJUSTING

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

1.36 OPERATION AND MAINTENANCE MANUAL

- A. Provide operation and maintenance manual for all mechanical and electrical equipment and systems supplied and installed in the Work.

1.37 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.

1.38 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.
- 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 - Basic Requirements
 - 2. Section 02 41 19 – Selective Structure Demolition

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, may 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 [may, 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.

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 Hackner 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	Name: _____
Wood	_____ cu. yds. _____ tons	_____ Recycled	_____ Reused	Name: _____
Wood Pallets	_____ units	_____ Recycled	_____ Reused	Name: _____
PVC Plastic	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Asphalt & Concrete	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Bricks & Masonry	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Vinyl Siding	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Cardboard	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Metals	_____ cu. yds. _____ tons	_____ Recycled	_____ Reused	Name: _____
Unpainted Gypsum / Drywall	_____ cu. yds. _____ tons	_____ Recycled	_____ Reused	Name: _____
Shingles	_____ cu. yds. _____ tons	_____ Recycled	_____ Reused	Name: _____
Fluorescent Lamps	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Foam Insulation	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Carpet Padding	_____ cu. ft. _____ lbs.	_____ Recycled	_____ Reused	Name: _____
Barrels & Drums	_____ units	_____ Recycled	_____ Reused	Name: _____

WASTE MANAGEMENT PLAN FORM

Glass	_____ cu. yds. _____ tons	_____ Recycled _____ Landfilled	_____ Reused _____ Other	Name: _____
Other	_____	_____ Recycled _____ Landfilled	_____ Reused _____ Other	Name: _____
Other	_____	_____ Recycled _____ Landfilled	_____ Reused _____ Other	Name: _____
Other	_____	_____ Recycled _____ Landfilled	_____ Reused _____ Other	Name: _____
Other	_____	_____ Recycled _____ Landfilled	_____ Reused _____ Other	Name: _____
Other	_____	_____ Recycled _____ Landfilled	_____ Reused _____ Other	Name: _____

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for the demolition of such features as required in these specifications and on the drawings. Included are the following:
 - 1. Protect portions of building adjacent to or affected by selective demolition. Take appropriate measures to protect existing facilities operations against dust contamination. Materials shall be removed from the existing building without disruption to the Owner or facility operations.
 - 2. Remove and legally dispose of demolished materials off-site.
 - 3. Demolish and salvage for reuse those items noted on the drawings.
 - 4. Recycle construction and demolition waste including metals and cardboard. Recycle carpet and ceiling tiles if practicable.

1.03 RELATED WORK

- A. Resilient Flooring, Section 09 65 00.
- B. Recycling, Section 01 74 19.

1.04 SUBMITTALS

- A. For utilities or other services requiring removal or abandonment in-place, submit materials documenting completion of such work.
- B. Submit copies of records documenting recycling of demolition materials from the site.

1.05 DEFINITIONS

- A. "Remove": Remove and legally dispose of items, except those indicated to be reinstalled.
- B. "Remove and Reinstall": Remove items indicated; clean, service and otherwise prepare them for reuse; store and protect against damage. Reinstall in the same location or in locations indicated.
- C. "Existing to Remain": Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the A/E, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.06 QUALITY ASSURANCE

- A. Comply with governing codes and regulations.

1.07 RECORD DRAWINGS

- 1 A. Maintain record drawings showing actual locations of utilities and other features encountered, and any
2 deviations from the original design. Show actual limits of removal and demolition.
3
- 4 1.08 SAFETY
5
- 6 A. Verify that all gas and electrical utilities have been abandoned or disconnected and associated hazards
7 mitigated, prior to beginning any demolition.
8
- 9 B. Take all necessary precautions while dismantling piping containing gas, gasoline, oil or other explosive
10 or toxic fluids or gases. Purge lines and contain materials in accordance with all applicable regulations.
11 Store such piping outdoors until fumes are removed.
12
- 13 C. Maintain a clean and orderly site. Remove debris at end of each workday.
14
- 15 D. If hazardous materials are not anticipated, but encountered, terminate operations and contact the Owner
16 immediately. Follow all applicable local, state and federal regulations pertaining to hazardous materials.
17
- 18 1.09 PERMITS
19
- 20 A. Unless otherwise noted, Contractor shall be responsible for obtaining and paying for all permits necessary
21 to complete demolition work.
22
- 23 B. If necessary, file and maintain Notification of Demolition and/or Renovation and Application for Permit
24 Exemption (WDNR Form 4500-113) in accordance with the Wisconsin Administrative Code Chapter
25 NR447.
26
- 27 1.010 DISCONNECTION OF SERVICES
28
- 29 A. Prior to starting removal and/or demolition operations be responsible and coordinate disconnection of all
30 existing utilities, communication systems, alarm systems and other services.
31
- 32 B. Disconnect all services in manner which insures continued operation in facilities not scheduled for
33 demolition.
34
- 35 C. Disconnect all services in manner which allows for future connection to that service.
36
- 37 D. Disconnect services to equipment at unions, flanges, valves, or fittings wherever possible.
38
- 39 1.011 REMOVAL/SALVAGING OF ITEMS
40
- 41 A. Carefully remove all items that are scheduled to be salvaged.
42
- 43 B. Secure salvaged items to allow for future movement; provide pallets, skids and other devices as
44 necessary. Secure all loose parts.
45
- 46 C. Provide crates, padding, tarps and other measures necessary to protect salvaged items during storage.
47 Store items in secure location, safe from vandalism, weather, dust and other adverse elements.
48
- 49 D. Where salvaged items are indicated to be turned over to Owner, deliver to location on property where
50 designated by Owner.
51

1 E. Where indicated to be incorporated into new work, store the salvaged item in secure location until trade
2 responsible for re-installation mobilizes his equipment and storage facilities to the site, or otherwise
3 accepts responsibility for the salvaged item.
4

5 F. Items of salvage value that are not to be returned to the Owner or the A/E shall be removed from the
6 structure. Storage or sale of such salvage items at project site is prohibited.
7
8

9 PART 2 - PRODUCTS

10
11 2.01 EQUIPMENT

12
13 A. Use Contractor's normal equipment for demolition purposes and which meets all safety requirements
14 imposed on such equipment.
15
16

17 PART 3 - EXECUTION

18
19 3.01 GENERAL

20
21 A. Examine all areas of work, verify all existing conditions, and report any unsatisfactory conditions.
22

23 3.02 PROTECTION OF EXISTING WORK AND FACILITIES

24
25 A. Verify the locations of, and protect, any building elements, utilities, and all other such facilities that are
26 intended to remain or be salvaged.
27

28 B. Make such explorations and probes as necessary to ascertain any required protection measures that shall
29 be used before proceeding with demolition.
30

31 C. Take all measures necessary to safeguard all existing work and facilities which are outside the limits of
32 the work.
33

34 D. Furnish and install temporary enclosures or other barriers as shown on the plans or as otherwise necessary
35 to protect existing features.
36

37 E. Protect adjacent interior areas from collection of dust and noxious fumes. Seal HVAC system ductwork
38 and grilles to prevent contamination of building or mechanical systems.
39

40 F. Provide protection for workers, public, adjacent construction and occupants of existing building(s).
41

42 G. Report damage of any facilities or items scheduled for salvaging to the Owner.
43

44 H. Repair or replace any damaged facilities that are not scheduled for demolition.
45

46 I. Do not damage building elements and improvements indicated to remain.
47

48 J. Do not close or obstruct walks, drives, other occupied or used spaces, or facilities without the written
49 permission from the A/E and the authorities having jurisdiction.
50

51 K. Do not interrupt utilities serving occupied facilities without permission from the A/E and authorities
52 having jurisdiction. If necessary, provide temporary utilities.
53

- 1 L. Cease operations if public safety or remaining structures are endangered. Perform temporary corrective
2 measures until operations can be continued properly.
- 3
- 4 M. If necessary, provide additional materials to protect existing building components that are to remain.
- 5
- 6 N. Where necessary to prevent collapse of any construction, install temporary shores, struts or bracing. Do
7 not commence demolition work until all temporary construction is complete.
- 8
- 9 O. Take precautions to guard against movement, settlement or collapse of any surrounding construction
10 designated to remain and be liable for any such movement, settlement or collapse.
- 11

12 3.03 DEMOLITION

- 13
- 14 A. Remove all equipment, fixtures and other materials scheduled for salvage prior to beginning demolition
15 operations.
- 16
- 17 B. Abandon gas, electric and communication utilities in accordance with local utility company requirements,
18 or applicable substantive requirements if considered private.
- 19
- 20 C. Remove all sealant, fasteners and damaged or rotten blocking from existing construction to remain where
21 demolition occurs.
- 22

23 3.04 RECYCLING

- 24
- 25 A. Transport and dispose all demolition waste in accordance with local, state, and federal guidelines and
26 Section 01 74 19 Recycling.
- 27

28 3.05 SCHEDULE

- 29
- 30 A. Items to be removed shall be as indicated on the Drawings.
31 1. Items to be stored and reinstalled.
32 2. Items to be removed from site by Contractor.
33
- 34 B. Items to remain (if clarification required).
- 35

36 3.06 CLEANING

- 37
- 38 A. All adjacent areas shall be broom cleaned and ready to receive new construction.
- 39
- 40 B. Remove from the site all debris resulting from the Work of this Section.
- 41

42 END OF SECTION 02 41 19

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SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

SCOPE

This section describes the products and execution requirements relating to furnishing and installation of Unit Masonry and related items for this project. Included are the following topics:

PART 1 - GENERAL	1
Scope	1
Related Work	1
Reference Standards	1
Submittals	1
Coordination	1
Quality Assurance	2
Delivery, Storage and Handling	2
Project/Site Conditions	2
PART 2 - PRODUCTS	2
Masonry Units, General	2
Concrete Masonry Units	2
Mortar And Grout Materials	3
Individual Ties and Anchors:	3
Mortar Mixes	3
PART 3 - EXECUTION	4
Examination	4
Preparation	4
Installation, General	4
Tolerances	4
Laying Masonry Wythes	5
Mortar Bedding and Jointing	5
Masonry Joint Reinforcement	5
Repairing and Pointing	6
Laying, Protection and Cleaning	6
Masonry Waste Disposal	6

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

REFERENCE STANDARDS

Abbreviations of standards organizations referenced are as follows:

ACI American Concrete Institute
ASCE American Society of Civil Engineers
ASTM American Society for Testing and Materials
TMS The Masonry Society

SUBMITTALS

Product Data: Submit manufacturer's product data for each type of masonry unit, accessory and other manufactured products.

COORDINATION

Examine all parts of the supporting structure and the conditions under which the masonry work is to be installed, and notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation of masonry work until unsatisfactory conditions have been corrected in a manner acceptable to this Section contractor.

Review installation procedures of other work by Subcontractors whose work must be coordinated with the masonry work.

1
2 The Contractor shall coordinate all work.

3
4 Consult with all Subcontractors and material suppliers whose involvement will be affected by the work of
5 this Section.

6
7 **QUALITY ASSURANCE**

8 Source Limitations for Masonry Units and Mortar Materials: One source from a single manufacturer for
9 each product utilized.

10
11 **DELIVERY, STORAGE AND HANDLING**

12 Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location,
13 cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install
14 until they are dry.

15
16 Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use
17 cementitious materials that have become damp or contaminated.

18
19 Store aggregates where grading and other required characteristics can be maintained and contamination
20 avoided.

21
22 Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into
23 dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under
24 cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

25
26 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

27
28 **PROJECT/SITE CONDITIONS**

29 Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed.
30 Immediately remove grout, mortar, and soil that come in contact with such masonry. Protect base of walls
31 from mortar splatter by spreading coverings on ground and over wall surface. Protect floor from mortar
32 droppings. Protect surfaces of door frames and steel channel with painted and integral finishes, from
33 mortar droppings.

34
35 **PART 2 - PRODUCTS**

36
37 **MASONRY UNITS, GENERAL**

38 Provide special shapes or sizes as indicated on the Drawings or where cutting of units would expose the cut
39 in the completed work.

40
41 Referenced masonry unit standards allow a certain percentage of units to exceed tolerances and to contain
42 chips, cracks or other imperfections exceeding limits stated in the standard. Do not use units where such
43 imperfections, including tolerances that vary more than the amount stated in the standard, will be exposed
44 in the completed Work.

45
46 **CONCRETE MASONRY UNITS**

47 Materials and Physical Properties: Concrete block units shall be made from materials and manufactured to
48 comply with all applicable requirements of ASTM C90, Solid Units of Normal Weight, typically cored. No
49 integral water repellent is permitted.

50 Source: All units shall be from one source and of uniform color and texture.

51
52 Size: Concrete block units shall be 7-5/8" x 15-5/8" x thickness indicated on Drawings. Concrete brick
53 may be of size as appropriate to facilitate the work.

54
55 Special Shapes: Provide where required for corners, jambs or other special conditions specifically
56 indicated including applications which cannot be produced by cutting of standard size units.

57
58 Protection: Concrete masonry units shall be protected from the elements for a minimum time of seven days
59 immediately prior to being incorporated into the Work.

1 **MORTAR AND GROUT MATERIALS**

2 Portland Cement: Shall conform to ASTM C150, Type I. Only one brand and kind of Portland cement
3 from one source shall be used for the work unless prior written approval is obtained from the A/E. Brands
4 are subject to approval of the A/E based upon the mortar color desired and obtainable by use of the various
5 brands readily available. No white cement or nonstaining cement will be required.

6
7 Lime: Shall be pressure-hydrated, non air-entrained and conform to ASTM C207, Type S.
8

9 Masonry Sand: Shall be clean, sharp, free from loam, silt, vegetable matter, salts, and other injurious
10 substances, and shall conform to ASTM C144. Sand is further subject to approval of the A/E, based on
11 mortar color desired and obtainable by use of local sands readily available, and shall be from one source.

12
13 Aggregate for Grout: ASTM C404.
14

15 Water: Shall be potable, fresh, clean, clear, and free of injurious amounts of oil, acid, alkali, salts, organic
16 matter or other detrimental substances, and handled in clean containers.
17

18 Plasticizer: Not permitted.
19

20 Water Repellent: Not permitted.
21

22 Coloring Pigments: Not permitted.
23

24 Other Admixtures: Shall not be used at any time and will not be knowingly approved. Use of special air-
25 entraining admixtures, chlorides or nitrates, with or without approval, will be sufficient cause to require
26 removal and replacement of all masonry work containing or treated with same.
27

28 The autoclave expansion of the cementitious portion of the mortar materials, when mixed in proportions
29 required under "mortar mixes," shall not exceed one-half percent when tested according to ASTM C151.
30 The air content of any mortar required under "mortar mixes" shall not exceed six percent when tested
31 according to ASTM C231 and/or ASTM C173 and/or ASTM C457.
32

33 Fully or partial premixed mortar materials will be considered for approval when each requirement of the
34 individual materials is complied with and is so stated on the container, or certified, along with proportions
35 and quantities.
36

37 **INDIVIDUAL TIES AND ANCHORS:**

38 Materials and Coatings: Provide galvanized (zinc coated) steel units conforming to Class B requirements
39 of ASTM A153, unless otherwise specified.
40

41 Juncture of Concrete Masonry Back-up with Concrete Columns: Provide corrugated dovetail tie 1" wide
42 by 12 gauge by 5-1/2" long, fitted to 12 gauge dovetail anchor; equivalent to Hohmann & Barnard, Inc.
43 # 303 corrugated dovetail brick tie with mill galvanized finish.
44

45 **MORTAR MIXES**

46 Conventional Job Mixed Mortar: Measure materials for mortars by volume, in a manner whereby
47 proportions can be controlled within two percent. Mix materials dry and then water to bring to proper
48 consistency for use. Mix materials in the approved type machine mixer of adequate capacity for 3 to 5
49 minutes after all materials have been introduced, until materials are evenly distributed throughout the batch
50 and the mixture is uniform in color with a workable consistency.
51

52 Silo Metered and Bulk Container Mortar: Shall comply with ASTM C1714. Use materials specified
53 hereinbefore and proportion mixes as specified hereinafter. Add water and mix according to system
54 manufacturer's recommendations.
55

56 Use maximum water consistent with good workability and freedom from smearing the face of masonry
57 work. Use no mortar that has stood more than one hour after initial mixing. Mortar less than one hour old
58 shall be reasonably retempered as necessary to maintain its workability, but used before it is one hour old
59 or otherwise discarded. No anti-freeze ingredient or contaminate of any type will be permitted.
60

1 Mortar for Concrete Block: Shall be ASTM C270, Type N, Cement-Lime Mortar conforming to the
2 proportion specification requirements. (1:1:6).

3
4 The proportions listed above are Portland cement, lime, damp loose sand, respectively by volume. The
5 proportions are listed only as samples for the required type mortars and shall be modified as necessary,
6 within tolerances, to suit the particular masonry sand being used.

7 8 **PART 3 - EXECUTION**

9 10 **EXAMINATION**

11 Examine Work of other Section Contractors on which or to which unit masonry is to be built, supported or
12 attached, to determine completeness and proper alignment to receive unit masonry. Do not commence
13 masonry work until all related noncompliant work has been corrected.

14
15 Before installation of masonry, examine rough-in and built-in construction for piping systems to verify
16 actual locations of piping connections.

17 18 **PREPARATION**

19 Verify that items provided by other Section Contractors are properly sized and located.

20
21 Verify that anchorages embedded in concrete are properly placed.

22
23 Establish lines, levels, and coursing. Protect from disturbance.

24
25 Provide temporary bracing during erection of masonry work. Maintain in place until building structure
26 provides permanent bracing.

27 28 **INSTALLATION, GENERAL**

29 Build interior concrete masonry walls to actual width of masonry units using units of widths indicated.

30
31 Leave openings for equipment to be installed before completing masonry. After equipment is installed,
32 complete masonry to match the construction immediately adjacent to opening.

33
34 Use full size units without cutting where possible. If cutting is required to provide a continuous pattern or
35 to fit adjacent construction, cut units with motor-driven saws to provide cuts that are straight and true,
36 resulting in clean, sharp unchipped edges of the units. Allow typical cut units to surface dry before laying.
37 Install cut units with cut surfaces and, where possible, cut edges concealed.

38
39 Select and arrange units for exposed masonry to produce a uniform blend of colors and textures.

40 41 **TOLERANCES**

42 Dimensions and Locations of Elements: For dimensions in cross section or elevation do not vary by more
43 than minus 1/4 inch or plus 1/2 inch.

44
45 For location of elements in plan do not vary from that indicated by more than minus \pm 1/2 inch in 20 feet or
46 \pm 3/4 inch total.

47
48 For location of elements in elevation do not vary from that indicated by more than \pm 1/4 inch in a story
49 height or \pm 3/4 inch total.

50
51 Lines and Levels: For bed joints, do not vary from level by more than \pm 1/4 inch in 10 feet, or \pm 1/2 inch
52 maximum.

53
54 For horizontal lines, do not vary from level by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch
55 maximum.

56
57 For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet,
58 or 1/2 inch maximum. Total vertical alignment of exposed head joints may have double these tolerances.

59
60 For lines and surfaces, do not vary from straight or plane by more than 1/4 inch in 10 feet, 3/8 inch in
61 20 feet, or 1/2 inch maximum.

62
63 For faces of adjacent exposed masonry units, do not vary from flush alignment by more than \pm 1/8 inch.

1 Joints: For bed joints, do not vary from thickness indicated by more than $\pm 1/8$ inch.

2
3 For head and collar joints, do not vary from thickness indicated by more than minus $1/4$ inch or plus
4 $3/8$ inch.

5
6 If the above tolerances cannot be met due to previous construction, notify the A/E.

7 8 **LAYING MASONRY WYTHES**

9 Lay out walls in advance for alignment of head joints with uniform joint thicknesses and for accurate
10 location of openings, movement joints, returns, and offsets. Maintain horizontal joint plane through all
11 wythes of masonry. Fully bond intersections, and external and internal corners. Avoid using less-than-
12 half-size units, particularly at corners, jambs, and, where possible, at other locations.

13
14 Bond Pattern for All Masonry: Lay masonry in $1/2$ running bond. Bond and interlock each course of each
15 wythe at corners. Do not use units with less than nominal 4 inch horizontal face dimensions at corners or
16 jambs.

17
18 Adjusting Units: Adjust the final position of each masonry unit while the mortar is still plastic. To replace
19 or reposition a unit after mortar has begun to set, remove the unit, replace the mortar with plastic mortar,
20 and replace the unit.

21
22 Tooling: Tool all mortar joints exposed in the finished work, including the bed joints.

23
24 Tool exposed joints when "thumb-print" hard with a round jointer, slightly larger than width of joint and of
25 sufficient length to obtain a straight and true mortar joint. Tooling shall be performed so that the mortar is
26 compressed and the joint surface is sealed and in intimate contact with the edge of the masonry unit. This
27 may require some craft persons to complete work after normal working hours. All crafts persons involved
28 in the project shall utilize new hardened steel jointers of the same size when beginning to lay masonry on
29 the project.

30
31 Stopping and Resuming Work: Stop off horizontal run of masonry by racking back $1/2$ length of unit in
32 each course from those in course below. Do not tooth except where necessary around openings. When
33 resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar.

34
35 Built-in Work: As construction progresses, build in items specified in this and other Sections. Include
36 built-in metal frames, anchor bolts, reglets, and other items to be built into the work supplied by other
37 Section Contractors. Bed anchors of hollow metal frames in mortar joints. Build in items plumb and level.
38 Fill in solidly with masonry around built-in items. Use ASTM C 476 grout or job mortar with high flow to
39 slush full voids between masonry and hollow metal door frames.

40
41 Cutting and Fitting: Cut and fit masonry units for steel channels, door and openings. Cooperate fully with
42 other Contractors to ensure correct size, shape and location.

43
44 Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire
45 mesh, or plastic mesh in the joint below and rod mortar or grout into the core.

46
47 Fill cores in concrete masonry units directly under lintels with mortar or grout.

48
49 Fill cores in concrete masonry units with mortar or grout above and below where portions of anchors are to
50 be installed.

51 52 **MORTAR BEDDING AND JOINTING**

53 For Concrete Masonry Units: Lay units with face shells fully bedded in mortar and with head joints of
54 depth equal to bed joints. For starting courses on concrete, lay units fully bedded in mortar, including areas
55 under cells.

56
57 Bed and head joints in masonry shall be of a nominal $3/8$ inch thickness.

58 59 **MASONRY JOINT REINFORCEMENT**

60 Install entire length of longitudinal wire in mortar bed joints with a minimum cover of $3/4$ inch on exterior
61 side of walls.

62
63 Do not bend typical continuous masonry joint reinforcement in the construction process.

1 Lap continuous masonry joint reinforcement ends a minimum of 6 inches.

2
3 Space continuous masonry joint reinforcement a minimum of 16 inches on center vertically.

4
5 Provide reinforcement no more than 8 inches above and below wall openings and extending 12 inches
6 beyond openings. Such reinforcement is in addition to continuous reinforcement when not coincident.

7
8 Interrupt joint reinforcement in a wythe wherever a movement joint occurs.

9
10 Provide continuity at concrete masonry wall intersections by using prefabricated T-shaped units or wire
11 mesh with cores filled.

12
13 Provide continuity at corners by using prefabricated L-shaped units.

14 15 **REPAIRING AND POINTING**

16 Remove and replace to A/E's satisfaction masonry units that are loose, chipped, broken, stained, or
17 otherwise damaged or that do not match adjoining units as intended. Install new units to match adjoining
18 units and install in fresh mortar, pointed to eliminate evidence of replacement.

19
20 Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with
21 mortar. Point up joints, including corners, openings, and adjacent work, to provide a neat, uniform
22 appearance. Prepare joints for sealant application, where indicated.

23 24 **LAYING, PROTECTION AND CLEANING**

25 All masonry shall be in final acceptance condition within 24 hours after laying and shall be maintained in
26 that condition, by meeting or exceeding the degree of cleanliness required, demonstrated on the approved
27 sample panel.

28
29 Lay masonry utilizing all necessary care to achieve cleanliness. Remove excess mortar from exposed
30 exterior and interior masonry surfaces as the work progresses and before it tenaciously adheres to the faces
31 of the masonry. Remove mortar protrusions and smears as masonry units are laid and tooled, as scaffolds
32 are raised, and at the start of the next day's work, leaving the surface of the masonry clean and finished.
33 Use calcimine brushes, stiff fiber brushes, other similar masonry units, burlap, rags, carpet remnants,
34 rubber floats, or other approved means. (Cleaning of masonry the morning after laying by the same masons
35 who laid the masonry the previous day, using stiff fiber brushes with or without water and sand, and
36 concentrating on cleaning the field of the masonry units has also been successfully used to achieve an
37 appearance matching or exceeding the cleanliness of the approved sample panel.) Use of chemical
38 cleaning or harsh physical cleaning will not be permitted. Included as chemical cleaners and prohibited are
39 most manufactured masonry cleaning solutions or compounds. Equipment or methods and techniques
40 utilized, reduced productivity, as well as weather conditions experienced will not relieve this Section
41 contractor of required compliance.

42
43 Protection shall be provided to prevent mortar spattering and maintain masonry in a clean condition so that
44 the masonry is satisfactory for acceptance when masonry work is completed. This may require covering
45 portions of finished masonry which is below new work in progress with polyethylene, canvas, or other
46 approved means. Extend covering a minimum of 24 inches down both sides of wall, and hold covering
47 securely in place. Hair-pin type devices frequently spaced have been successfully used in the past. When
48 practical, lay masonry from the top floor down.

49
50 No final washdown is required unless removal of earthy construction dirt or dust is necessitated by
51 extremely unusual site conditions.

52 53 **MASONRY WASTE DISPOSAL**

54 Excess masonry materials are this Section contractor's property and shall be removed from the Project site
55 upon completion of unit masonry work.

56
57
58 **END OF SECTION**

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Exterior non-load-bearing wall framing.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: Snow = 30 psf.; Wind = 25 psf lateral and uplift.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following.
 - a. Exterior Load-Bearing and Non-Load-Bearing Wall Framing: Horizontal deflection of 1/360 of wall height except at wall framing supporting masonry wall where horizontal deflection shall be 1/600 of the wall height.
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F .
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 - 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.03 SUBMITTALS

- A. Product Data: For each type of product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification data.
- E. Product test reports.
- F. Research/evaluation reports.

1.04 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.
- D. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."
- E. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 - 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- G. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60, A60, AZ50, or GF30.

2.02 FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.
- C. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.03 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.
- B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- C. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by mechanically deposition according to ASTM B 695, Class 50.
- D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.04 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
- C. Install framing members in one-piece lengths.
- D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

- E. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.02 INSTALLATION

- A. Install continuous tracks sized to match joists. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of joists to track, unless otherwise indicated. Space studs as follows:
 - 1. Joist Spacing: As indicated; 16" on center maximum.

3.03 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

1 SECTION 06 10 00

2
3 ROUGH CARPENTRY

4
5 PART 1 - GENERAL

6
7 1.01 RELATED DOCUMENTS

- 8
9 A. Conditions of the Contract and portions of Division One of this Project Manual apply to this
10 Section as though repeated herein.

11
12 1.02 SCOPE

- 13
14 A. Perform all Work required to complete the Rough Carpentry indicated by the Construction
15 Documents, and furnish all items necessary for its proper installation.

16
17 1.03 WORK INCLUDED

- 18
19 A. Wood Blocking, Cants and Nailers.

20
21 1.04 RELATED WORK

- 22
23 A. Solid Surface, Section 06 61 00.
24
25 B. Plastic Laminate-Faced Casework, Section 06 41 16.
26
27 C. Division 7, Thermal and Moisture Protection

28
29 1.05 SUBMITTALS

- 30
31 A. Submit in accordance to the General Conditions of the contract.
32
33 B. Material certificates for dimensional lumber specified to comply with minimum allowable unit
34 stresses indicated on the documents. Indicate species and grade selected for each use, and
35 design values approved by American Lumber Standards Committee.
36
37 C. Schedule for completion of rough framing for coordination of templating for shop fabrication
38 of architectural woodwork.
39
40 D. Wood treatment data as follows, including chemical treatment manufacturer's warranty and
41 instructions for handling, storing, installing, and finishing treated materials:
42
43 1. For each type of preservative-treated wood product, include certification by treating plant
44 stating type of preservative solution and pressure process used, net amount of preservative
45 retained, and compliance with applicable standard.

46
47 1.06 REFERENCES

- 48
49 A. American Institute of Timber (AITC)
50 1. AITC, Timber Construction Manual
51
52 B. American Forest and Paper Association (AFPA)
53 1. AFPA, National Design Specification for Wood Construction.
54 2. AFPA, Design Values for Wood Construction, NDS Supplement.
55

- 1 C. American Plywood Association (APA)
- 2 1. APA, Plywood Design Specification.
- 3
- 4 D. American National Standards Institute (ANSI)
- 5 1. ANSI A190.1, Structural Glued Laminated Wood.
- 6 2. ANSI A208.1, Material Formed Wood Particle Board.
- 7
- 8 E. American Society for Testing and Materials (ASTM)
- 9 1. ASTM E84, Test for Surface Burning Characteristics of Building Materials.
- 10
- 11 F. American Wood Preservers Association (AWPA)
- 12 1. AWPA C-20, Structural Lumber - Fire Retardant Treatment by Pressure Processes.
- 13
- 14 G. American Wood Preservers Bureau (AWPB)
- 15 1. AWPB LP-2, Pressure Treatment with Water-Borne Preservatives.
- 16
- 17 H. National Bureau of Standards (NBS)
- 18 1. NBS PS 1, Voluntary Product Standard for Construction and Industrial Plywood.
- 19 2. NBS PS 20, Voluntary Product Standard for Lumber.
- 20

21 1.07 DELIVERY, STORAGE AND HANDLING

- 22
- 23 A. Deliver materials to the site dry and store above ground on level wood blocking, cover from
- 24 rain, allowing drainage of water from all parts. Handle with care to avoid damage.
- 25

26 1.08 COORDINATION

- 27
- 28 A. Correlate location of all framing, furring, blocking, grounds and similar items with all trades.
- 29
- 30 B. Verify all dimensions and shop drawing requirements prior to proceeding with work.
- 31
- 32 C. Avoid delay of work of other trades dependent on or affected by carpentry work.
- 33

34 1.09 ENVIRONMENTAL REQUIREMENTS

- 35
- 36 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the
- 37 building (defined as inside the weatherproofing system and applied on site) must not exceed
- 38 the following requirements.
- 39 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
- 40 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
- 41 date January 7, 2005.
- 42 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements
- 43 in effect on October 19, 2000.
- 44
- 45 B. Low- Emitting Materials, Composite Wood & Agrifiber Products: Composite wood and
- 46 agrifiber products used inside the weatherproofing system shall contain no added urea-
- 47 formaldehyde resins.
- 48 1. Laminating Adhesives used to fabricate on-site and shop applied composite wood and
- 49 agrifiber assemblies shall contain no added urea-formaldehyde resins.
- 50

51 PART 2 - PRODUCTS

52 2.01 MATERIALS

- 1 A. Wood for nailers, blocking, furring, sleepers and other miscellaneous boards: Construction
2 grade, S4S, dried, 19 percent maximum moisture content. Pressure preservative treat items in
3 contact with flashing, waterproofing, masonry, concrete or the ground.
4
5 B. Wall Sheathing
6
7 1. Plywood sheathing shall be 5/8 inch thick (or as indicated on drawings), 5-ply, CDX APA
8 Rated, un-sanded with a minimum 24/0 span rating. Sheathing shall be by 48 inches wide
9 by 96 inches long.
10
11 C. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2 for interior
12 construction not in contact with the ground, Use Category UC3b for exterior construction not
13 in contact with the ground, and Use Category UC4a for items in contact with the ground.
14 1. Treat wood materials subject to insect attack. Moisture content after treatment shall be 19
15 percent for lumber and 15 percent for plywood.
16 2. Preservative Chemicals: Water-borne, alkaline copper quaternary (ACQ) preservatives.
17 a. Acceptable to authorities having jurisdiction and containing no arsenic or
18 chromium.
19
20 D. Fire-retardant treated wood products shall be pressure-impregnate wood materials to comply
21 with ASTM E84, Class A and with AWWA C-20 and C-27. Each piece shall bear UL label
22 "FR-S" for 25 maximum flame spread. Moisture content after treatment shall be 19 percent for
23 lumber and 15 percent for plywood.
24 1. Treated materials shall be "Dricon" as manufactured by Koppers Company, Inc.
25 2. Application: Treat all rough carpentry, unless otherwise indicated.
26 a. Concealed blocking.
27 b. Plywood backing panels.
28
29 E. Rough hardware shall include all nails, spikes, screws, bolts and similar items of types and
30 sizes sufficient to draw and rigidly secure members for which they are used. Fasteners shall be
31 galvanized plated at exterior locations and at all treated wood applications.
32
33 F. Adhesive shall be of proper design and characteristics to rigidly secure materials for which
34 they are used. Adhesive shall be "Titebond VOC-Compliant Heavy Duty Construction
35 Adhesive" conforming with ASTM C557, as manufactured by Franklin International; or
36 approved equal.
37 1. Provide construction adhesive with a VOC content of less than 70 g/l.
38
39 G. Miscellaneous Materials
40 1. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a
41 sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from
42 manufacturer's standard widths to suit width of sill members indicated.
43

44 PART 3 - EXECUTION

45 3.01 PREPARATION

- 46 A. Examine all adjoining work, verify all governing dimensions, and report any unsatisfactory
47 conditions.
48

49 3.02 GENERAL INSTALLATION

- 50 A. Install materials and systems in accordance with manufacturer's published instructions and
51 requirements. Install materials with uniform appearance and in proper relation with adjacent
52 construction.
53
54
55

- 1
2 B. Cut and frame all lumber into the respective locations, true to line, grade, plumb and level.
3 Form nailers, blockings and bucks to the shape and dimension indicated. Cut and frame all
4 rough carpentry work required by the other sections.
5
6 C. Use only sound, thoroughly seasoned materials of longest practical lengths and sizes to
7 minimize jointing. Use materials free from warp which cannot be easily corrected by
8 anchoring and attachment.
9
10 D. Treat all wood nailers, sleepers, blocking, furring, other wood in contact with concrete,
11 masonry adjacent to grade or exterior which shall be inaccessible in finished work.
12
13 E. Provide blocking, bucks and framing for all trades as required.
14
15 1. Blocking to be provided at the following locations:
16 a. All wall hung casework, cabinetry, countertops and shelving.
17 b. All wall hung/mounted equipment, including but not limited to flat screen
18 monitors, brackets, autopsy/lab equipment, etc.
19 c. All wall hung writing surfaces
20 d. And as indicated on drawings.
21
22 F. Include 2 inch nominal blocking in metal stud partitions required for backing of all accessories,
23 cabinetry, and other surface or recessed items.
24
25 G. Where finish trim is applied directly to framing members or blocking, such members shall be
26 perfectly straight, clear and well seasoned. Warp or other poor characteristics not allowed.
27
28 H. Provide solid surfaces at least 1 1/2 inches wide in both directions at all corners for securing
29 finishes.
30

31 3.03 HARDWARE
32

- 33 A. Secure permanently and in proper position all materials with the necessary fastenings to
34 provide the strength and rigidity required to complete the work. Provide washers under bolt
35 heads and nuts in contact with wood.
36
37 B. Bolt nailers and blocking to steel, masonry or concrete members with bolts of proportionate
38 strength of members attached, length required, spaced 2 feet 0 inches on center and 4 inches
39 from each end, except as otherwise indicated. Unless otherwise indicated, anchor bolts shall
40 be 3/8 inch diameter by length required or comparable power actuated fasteners.
41
42 C. Nail plywood in accord with APA recommendations.
43

44 3.04 TEMPORARY ENCLOSURES
45

- 46 A. The Subcontractor shall furnish, erect, keep in good repair and remove all necessary temporary
47 guard rails, barricades, pedestrian walkways, temporary ladders, building enclosures and
48 partitions (including temporary wood doors hung on temporary wood bucks at exterior door
49 entrances, doors to allow emergency egress by building occupants) and all other necessary
50 temporary enclosures as required as the work progresses.
51

52 3.05 CLEANING
53

- 54 A. Remove from the site all debris resulting from the Work of this Section.
55

END OF SECTION 06 10 00

1 SECTION 06 20 00

2
3 FINISH CARPENTRY

4
5 PART 1 - GENERAL

6
7 2.01 RELATED DOCUMENTS

- 8
9 A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section
10 as though repeated herein.

11
12 2.02 WORK INCLUDED

- 13
14 A. Carpentry work which is exposed to view, non-structural, and not specified as part of other sections.
15 B. The types of finish carpentry include, but are not necessarily limited to the following:
16 1. Wood fence
17 2. Interior wood wall hooks.

18
19 2.03 RELATED WORK

- 20 4. Rough Carpentry: Section 06 10 00.
21 5. Painting: Section 09 90 00.

22
23 2.04 SUBMITTALS

- 24
25 A. General: Submit each item in this article according to the General Conditions of the Contract.
26 1. Shop drawings for all millwork; receive approval prior to fabrication; draw in related or
27 dimensional position with sections shown either full size or 3-inch scale.
28 2. Samples:
29 1. One 24-inch- long section of wood running trim, slats or similar lineal mill work.
30
31 B. Product Data: For each type of component required. Include but not limited to the following:
32 1. Manufacturer's data on hardware, accessories, and finishes.

33
34 2.05 REFERENCES

- 35
36 A. Western Red Cedar Lumber Association "Designer's Handbook".

37
38 2.06 QUALITY ASSURANCE

- 39
40 A. Quality Standards: Architectural Woodwork Quality Standards, Guide Specification and Quality
41 Control Program as set forth by the Architectural Woodwork Institute (AWI).
42 B. Architectural Woodwork Manufacturer: Experienced in this type of work; successfully completed
43 comparable work.
44 C. Deviations from quality, grade, species, and finish specified under AWI Interior Woodwork for
45 Transparent Finish and Interior Woodwork for Paint Finish will be allowed for individual items or
46 components only if specified under separate headings covering such items.

47
48 2.07 DELIVERY, STORAGE AND HANDLING

- 49
50 A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage,
51 soiling and deterioration.
52 B. Do not deliver finish carpentry materials until painting, wet work, grinding and similar operations
53 which could damage, soil or deteriorate woodwork have been completed.

54
55 2.08 ENVIRONMENTAL REQUIREMENTS

- 1
2 1. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings
3 applied on-site must meet the limitations and restrictions concerning chemical components
4 set by the following standards:
5 2. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
6 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
7 January 1, 2004.
8
9 2.09 Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the
10 building (defined as inside the weatherproofing system and applied on site) must not exceed
11 the following requirements.
12 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
13 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
14 2005.
15 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
16 effect on October 19, 2000.
17
18 2.010 Low- Emitting Materials, Composite Wood & Agrifiber Products: Composite wood and
19 agrifiber products used inside the weatherproofing system shall contain no added urea-
20 formaldehyde resins.
21 1. Laminating Adhesives used to fabricate on-site and shop applied composite wood and
22 agrifiber assemblies shall contain no added urea-formaldehyde resins.
23
24

25 PART 2 - PRODUCTS

26 2.01 MATERIALS, GENERAL

- 27
28
29 A. Lumber standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber
30 and with applicable grading rules of inspection agencies certified by American Lumber Standards
31 Committee Board of Review.
32
33 2.02 Inspection Agencies: Inspection agencies, and the abbreviations used to reference them,
34 include the following:
35 1. NELMA – Northeastern Lumber Manufacturers Association.
36 2. NHLA – National Hardwood Lumber Association.
37 3. NLGA – National Lumber Grades Authority.
38 4. SPIB - Southern Pine Inspection Bureau.
39 5. WCLIB – West Coast Lumber Inspection Bureau.
40 6. WWPA – Western Wood Products Association.
41
42 2.03 Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection
43 agency evidencing compliance with grading rule requirements and identifying grading agency,
44 grade, species, moisture content at time of surfacing, and mill.
45
46 2.04 For exposed lumber, furnish pieces with grade stamps applied to ends of back of each piece, or
47 omit grade stamps entirely and provide certificates of grade compliance issued by inspection
48 agency.
49
50 2.05 SCHEDULE OF MATERIALS
51
52 A. WD-1
53 1. Species: Western Red Cedar
54 2. Grade: WRCLA, A Clear.
55 3. Texture: See below.

- 1 4. Moisture Content: Kiln dried to less than 15% moisture content.
- 2 5. Sight exposed.
- 3 6. Finish: see 09 90 00.
- 4 7. Sizes:
- 5 1. 1 x 6 noted on drawings on the exterior fence are to be 5/4 x 6 x lengths as indicated
- 6 on drawings at exterior fence. S4S Smooth.
- 7 2. 1 x 6 at interior wall hooks. S1S2E smooth.
- 8

9 2.06 ACCESSORIES

- 10
- 11 A. Provide nails, screws and other anchoring devices of the proper type, size, material and finish for
- 12 application to provide secure attachment, concealed where possible, and complying with applicable
- 13 Federal Specifications.
- 14 B.
- 15 1. Nails, Wire, Brads and Staples: FS FF-N-105.
- 16 1. Nails must not penetrate finished interior surface of Cedar at benches, shelves,
- 17 reception desk.
- 18 2. Power-Driven Fasteners: CABO NER-272.
- 19 3. Cedar to be fastened with 304 (18-8) or better stainless steel fasteners only.
- 20
- 21 1. Where interior finish carpentry materials are exposed in areas of high humidity,
- 22 provide fasteners and anchorages with hot-dip galvanized coating complying with
- 23 ASTM A 153 or No. 304 stainless steel.
- 24 2. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for
- 25 general carpentry use. Exterior rated for exterior use.
- 26

27 Sealants: Comply with requirements of Division 7 Section "Joint Sealants" for materials required for

28 sealing work.

29

30 2.07 FABRICATION

- 31
- 32 A. Wood Moisture Content: Comply with requirements of specified inspection agencies and
- 33 manufacturer's recommendations for moisture content of finish carpentry.
- 34
- 35 B. Field Dimensions
- 36 1. Millwork Manufacturer: Responsible for details, dimensions not controlled by job conditions;
- 37 show on shop drawing all field measurements beyond his control. Contractor, Woodwork
- 38 Manufacturer: Cooperate to establish, maintain these field dimensions.
- 39 C. Leave all surfaces clean and true and all exposed wood surfaces sanded parallel with grain, free of
- 40 discernible marks and ready for work under Division 9 Section "Painting
- 41
- 42 D. Cutouts: Make those required for mechanical and electrical items.
- 43
- 44 E. Back out or kerf backs of the following members, except members with ends exposed in finished
- 45 work:
- 46 1. Standing and running trim wider than 5 inches.
- 47
- 48 F. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius.
- 49
- 50 G. Ease edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.
- 51
- 52
- 53

54 EXECUTION

55

1 2.01 EXAMINATION

- 2
3 A. Examine substrates, with Installer present, for compliance with requirements for installation
4 tolerances and other conditions affecting installation and performance of finish carpentry. Do not
5 proceed with installation until unsatisfactory conditions have been corrected.

6
7 2.02 PREPARATION

- 8
9 A. Condition wood materials to average prevailing humidity conditions in installation areas prior to
10 installing.
11
12 B. Examine substrate before installation. Verify that substrate is sound and plumb/level. Proceed with
13 installation only after unsatisfactory conditions have been corrected.
14
15 C. Coordinate woodwork installation with wall flashings and other built-in components.
16
17 D. Prime and backprime exterior wood, including cut ends, for painted, stained and oil finish exposed
18 on the exterior. Comply with requirements for surface preparation and application in Division 9
19 Section "Painting".

20
21 2.03 INSTALLATION

- 22
23 A. Do not use finish carpentry materials that are unsound, warped, improperly treated or finished,
24 inadequately seasoned, or too small to fabricate with proper jointing arrangements.
25 B. Install finish carpentry plumb, level, true and aligned with adjacent materials. Use concealed shims
26 where required for alignment.
27 C. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by
28 manufacturer.
29 1. Countersink nails; fill surface flush and sand where face nailing is unavoidable.
30
31 D. Install to tolerance of 1/8 inch in 96 inches for plumb and level. Install adjoining finish carpentry
32 with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal
33 installation.
34
35 E. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim
36 and rails.
37 1. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim
38 and rails.
39
40 F. Finish according to specified requirements.
41 1. Refer to Division 9 Sections for final finishing of finish carpentry.

42
43 2.04 STANDING AND RUNNING TRIM INSTALLATION

- 44
45 A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of
46 lumber available. Do not use pieces less than 24 inches long, except where necessary.
47 1. Stagger joints in adjacent and related standing and running trim.
48 1. Cope at returns and miter at corners to produce tight-fitting joints with full-surface
49 contact throughout length of joint.
50 2. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform
51 thickness across joints, if required.
52
53 B. Match color and grain pattern across joints.
54
55 C. Drill pilot holes in wood before fastening as required to prevent splitting.

- 1 1. Fasten to prevent movement or warping.
2 1. Countersink fastener heads on exposed carpentry work and fill holes.
3 2. Stagger nails along the length of long pieces of trim.
4
5 2.05 EXTERIOR LUMBER INSTALLATION
6
7 A. Drill pilot holes in hardwood species before fastening as required to allow penetration of fasteners
8 and to prevent splitting.
9 1. Fasten to prevent movement or warping.
10 1. Countersink fastener heads on exposed carpentry work.
11
12 2.06 ADJUSTING
13
14 A. Repair damaged or defective work as directed.
15 B. Adjust and lubricate hardware for proper operation.
16
17 2.07 CLEANING
18
19 A. Clean exposed surfaces.
20 B. Clean shop-finished woodwork, touch-up finish as required and remove and refinish damaged or
21 soiled areas of finish.
22 C. Protect finish carpentry and maintain conditions necessary to ensure that work will be without
23 damage or deterioration at time of acceptance.
24
25
26

END OF SECTION 06 20 00

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SECTION 06 41 16

PLASTIC LAMINATE CLAD CASEWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Base, Wall and Custom Storage Cabinets and associated Partitions and Shelving.
- B. Hardware.

1.03 RELATED WORK

- A. Rough Carpentry: Section 06 10 00.
- B. Joint Sealers: Section 07 92 00.
- C. Solid Surface: Section 06 61 18.

1.04 REFERENCES

- A. Plastic Laminate: National Electrical Manufacturers Association (NEMA) Publication No. LD3-1991.
- B. Fiberboard Core: ANSI A208.2.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Product Data: Manufacturer's catalog information edited to indicate specific products and related accessories to be provided for this Project.
 - 2. Shop Drawings: Show layout of casework, typical details of construction, and finish selections.
 - a. Locate rough-in for services required and show methods of compensating for minor variations in actual job conditions within specified tolerances.
 - b. Include details of fastening to all other work, countertop layout for each location, details of countertop construction including backsplash, endsplash, and edge details, plastic laminate selections previously made by Architect/Engineer and type of core substrate material.
 - c. Field measure for all countertops.
 - d. Indicate all hardware and keying schedule.

1.06 QUALITY ASSURANCE

- A. Quality Standards: Perform work in accordance with Architectural Woodwork Quality Standards (current edition), Guide Specification and Quality Control Program as set forth by the Architectural Woodwork Institute (AWI).
- B. ANSI/BHMA A156.9 – Cabinet Hardware.

1 1.07 DELIVERY, STORAGE AND HANDLING

- 2
- 3 A. Deliver casework items only when proper storage conditions will be available. Store casework in protected
- 4 area until ready for installation.
- 5
- 6 B. Maintain optimum humidity and temperature conditions after receipt of materials.
- 7
- 8 C. Store in manner to allow free circulation of air around all items.
- 9
- 10 D. Maintain temperature of casework storage areas between 50 to 75 degrees Fahrenheit.
- 11

12 PART 2 - PRODUCTS

13

14 2.01 CASEWORK

- 15
- 16 A. AWI Section 400, Custom grade.
- 17

18 2.02 MANUFACTURERS

- 19
- 20 A. The following casework manufacturers are acceptable as long as they meet or exceed this specification.

- 21 1. A.J. Pietsch Company, (414) 342-0531.
- 22 2. Carley Wood Associates, Inc. (608) 249-7444.
- 23 3. Central Wisconsin Woodworking, (715) 675-4491.
- 24 4. Creative Laminates, Inc., (800) 441-5885.
- 25 5. Diversified Woodcrafts Inc., (920) 842-2136.
- 26 6. Glenn Rieder, Inc., (414) 449-2888.
- 27 7. Hillcraft Ltd., (608) 221-3220.
- 28 8. Stück Wood Works Inc., (414) 351-5595.
- 29 9. T. J. Hale Company, (262) 255-5555.
- 30 10. Techline, (608) 238-6868.
- 31 11. Wood Design Inc., (920) 563-4833.
- 32 12. Woodmill Products, Inc., (262) 754-4641.
- 33 13. Or approved equal.

- 34
- 35 B. Hardware manufacturers.

- 36 1. Doug Mockett & Co. (800) 523-1269.
- 37 2. A&M Hardware (888) 647-0200
- 38 3. Or approved equal.
- 39

40 2.03 BASE AND CUSTOM STORAGE CABINETS

- 41
- 42 A. Bottoms, Sides and Sub-top: 3/4-inch 45-47 pound density particle board.

- 43 1. Finish where not exposed: 8 to 11 mil melamine resin overlay.
- 44

- 45 B. Back Panel: 3/8-inch 45-47 pound density particle board.

- 46 1. Finish: 8 to 11 mil melamine resin overlay to match cabinet interior.
- 47 2. Non-Exposed Side Finish: 8 to 11 mil melamine resin overlay to match.
- 48 3. If back exposed, provide 3/4-inch material, finished to match.
- 49

- 50 C. Top of Base, Custom Storage Cabinet: Full framed wood. Provide full sub-top and 6 inch spreaders between
- 51 all drawers and door/drawer.
- 52

- 53 D. Back panels rabbeted into sides top and bottom. Secure with hot melt glue or glue and mechanical fasteners.

- 1
2 E. Provide finished end panels at all exposed end locations. Ends adjacent to appliances shall be considered as
3 exposed ends.
4
- 5 2.04 DOOR/DRAWER CONSTRUCTION AND EDGING
6
- 7 A. Door/Drawer Fronts: 3/4-inch thick core.
8
- 9 B. Exposed Edges, Endsplashes:
10
11 1. Finished to match exposed face.
12 2. At repair in Room 107. Provide PVC edge. Color to be selected from manufacturer's full line of color.
13
- 14 C. Laminate face/balancer to core with PVA rigid adhesives, under pressure, nor natural setting process. Heat
15 process or contact adhesive not allowed.
16
- 17 D. Door/Drawer/Cabinet Body Edges: 1 mm PVC thru-color, acid resistant hot melt applied.
18
- 19 2.05 PLASTIC LAMINATE SURFACING
20
- 21 A. Manufacturers: Wilsonart , Arpa, Formica, Lamin-Art, Nevamar, or approved equal.
22
- 23 B. Exposed Exterior Surfaces (except countertops): NEMA GP28, 0.028 inch thick, standard vertical grade.
24
- 25 C. Interior Surfaces/Backing Sheets: NEMA CL20, 0.020 inch thick, standard cabinet liner grade if applicable.
26
- 27 D. Colors:
28
29 1. Match Existing Plastic Laminate surfaces in kitchenette.
30
- 31 2.06 DRAWERS
32
- 33 A. Backs, Sides, Fronts: 1/2-inch thick, medium density fiberboard with melamine overlay.
34
- 35 B. Dovetail/dado fronts and backs, secure with glue.
36
- 37 C. Bottoms: 3/8-inch thick.
38
- 39 D. Rabbet bottoms into sides, front and back; staple and glue.
40
- 41 E. Drawer fronts screwed on from drawer inside.
42
- 43 F. Reinforcement: 1/2 inch thick under-bottom stiffeners, one at 24 inch drawers, two at 36 inch drawers, four at
44 48 inch drawers.
45
- 46 2.07 SHELVES
47
- 48 A. Shelves under 27 inches long: 3/4-inch thick 45-47 pound density particle board.
49
- 50 B. Shelves over 27 inches long: 1 inch thick 45-47 pound density particle board.
51
- 52 C. Finish: Finished to match faces.
53

1 D. Edging: Material to match the shelf.

2

3 2.08 BASES

4

5 A. Two, continuous, 4 inch high by 1-1/2 inch thick lumber, or 4 inch high by 3/4 inch exterior grade plywood, 2
6 foot on center. See drawings for base dimension.

7

8 B. Provide two positioning strips to cabinet bottom for concealed fastening.

9

10 2.09 COUNTERTOPS

11

12 A. Plastic Laminate: 1-1/2 inches thick 45-47 pound density particle board, NEMA GP50 finish top and edges,
13 and NEMA CL20 backer sheet.

14 1. Square front edge, back and side splashes. Provide cutouts for built-in fixtures.

15

16 2.010 HARDWARE

17

18 A. Pulls:

19 1. Match existing pulls or reuse salvaged pulls.

20

21 B. Self-Closing Hinges: Blum Model 71.6530 with 175L8100 base plate.

22

23 C. Drawer Slides: Accuride or approved equal.

24

25 D. Locks:

26 1. Cabinet Locks: Keyed to match, five pin. All casework to be lockable. Key casework alike per area.

27 2. Custom Storage Cabinet Locks: Hafele, Safe-o-Mat Coin Return Locks, Series 500.

28

29 E. Steel Brackets

30 1. For upper shelving and work surfaces: Hafele, Hebgo bracket, approved equal by A&M Hardware or
31 approved equal.

32 a. Color: To be selected by Architect from full line of powder coat finishes.

33

34 F. Hardware finish: 626 (US26D) Brushed Chrome.

35

36 2.011 WORKMANSHIP

37

38 A. Cabinet parts shall be accurately machined utilizing hardwood dowels for premium quality grade joinery
39 construction. Glue and mechanically fasten all joints for maximum rigidity.

40

41 B. All cases shall be square, plumb, true and self-supporting.

42

43 PART 3 - EXECUTION

44

45 3.01 DELIVERY

46

47 A. Store and install in a ventilated building not exposed to extreme temperature and/or humidity.

48

49 3.02 INSTALLATION

50

51 A. Installation shall be by the manufacturer's authorized representatives using factory trained personnel
52 experienced in the installation of this type of equipment.

53

- 1 B. Uncrate, set up, place, level, scribe and anchor all cabinets according to manufacturer's recommendations.
2
3 C. Remove and replace tops, backs, panels, shelves and other items necessary to allow other Sections to complete
4 their work of connecting services.
5
6 D. Do all cutting, boring, patching required for the installation of work of other Sections.
7
8 E. Provide all necessary fillers, panels, end panels, scribes required to make complete installation as detailed.
9
10 F. Where casework meets wall surfaces, set with uniform space not to exceed 1/8-inch. Seal all joints with
11 silicone sealant to a slightly concave joint, using backer rod where required. Apply sealant in accord with
12 Section 07 92 00.
13
14 G. Cabinets with surfaces having machine or tool marks will be rejected.
15
16 H. All finishes must be smooth, uniform in color and match approved sample.
17
18 I. Prior to final inspection, examine installation of the work of this Section. Repair or replace all defects found.
19 Leave installation clean, undamaged and ready for use.
20
21
22

END OF SECTION 06 41 16

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SECTION 06 61 18

SOLID SURFACE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Solid surface countertop

1.03 RELATED WORK

- A. Rough Carpentry: Section 06 61 00.
- B. Plastic Laminate Clad Casework: Section 06 41 16
- C. Gypsum Wall Board Section 09 29 00.

1.04 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.
 - 1. Product Data: Manufacturer's catalog information edited to indicate products to be provided for this Project.
 - a. Joint adhesives or mastics, color matched.
 - b. Joint sealants.
 - c. Fastening adhesive
 - 2. Samples:
 - a. Product Data.
 - b. Solid surface sheet material.
 - c. Include color chart showing full range of available colors for sheet

1.05 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications: Minimum three years experience in fabrication and installation of solid surface materials or certification by Distributor.
 - 1. Qualifications: Proof of fabricator qualifications.
 - 2. Certificates: Copies of ISO certifications.
 - 3. Test Reports:
 - a. Flammability test reports.
 - b. Food preparation zone use test reports.
 - 4. Manufacturer's Fabrication and Installation Manual.
 - 5. Manufacturer's Fabrication and Installation Check List.

- B. Shop Drawings: Provide plans, sections, and large-scale details. Include attachment provisions and fabrication methods.

1.06 WARRANTY

- 1 A. Provide manufacturer's standard 10 year warranty against defects in workmanship.
2
3 1.07 MAINTENANCE
4
5 A. Extra Materials: Provide for future repair use by Owner.
6 1. Minimum 4 sf per 50 lf of each color material.
7
8 1.08 SPECIAL INSTRUCTIONS
9
10 A. Do not deliver components to project site until spaces are ready for installation.
11
12 1.09 ENVIRONMENTAL CONDITIONS
13
14 A. Installation spaces must be maintained at normal occupancy temperature and humidity levels for
15 minimum 72 hours prior to and continuously following installation.
16
17 1.010 ENVIRONMENTAL REQUIREMENTS
18
19 A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-
20 site must meet the limitations and restrictions concerning chemical components set by the following
21 standards:
22 1. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
23 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
24 January 1, 2004.
25
26 B. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
27 (defined as inside the weatherproofing system and applied on site) must not exceed the following
28 requirements.
29 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD)
30 Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7,
31 2005.
32 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in
33 effect on October 19, 2000.
34
35
36 PART 2 - PRODUCTS
37
38 2.01 MATERIALS
39
40 A. Solid Surface
41 1. Solid Surface
42 a. Formica, Solid Surfacing
43 b. Or approved equal by: Dupont, Corian; Wilsonart, Solid Surfacing.
44
45 B. No cracked, chipped, broken, stained, or defective material will be accepted.
46 1. Materials fabricated to thickness and size shown on drawings.
47 a. All sizes to be field verified.
48
49 C. Color Match Differences: Minimal.
50
51 D. Adhesives: Use manufacturer's recommended adhesives, and installation instructions. See product
52 fabrication manuals for application techniques and surface preparation.
53
54 2.02 FABRICATION

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40

- A. Field verify measurements.
- B. Finished Surfaces: Uniform as chosen by A/E from full range with all edge profiles as shown on drawings.
- C. Color and finish: To be selected by Architect from full range of colors and finishes.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine cabinets upon which countertops will be installed. Coordinate with cabinet specification section to assure that cabinets are set to the following tolerance or better.
 - 1. Verify that cabinets are level to 1/8 in. in 10 ft .
 - 2. Review manufacturer’s Fabrication and Installation Check List.
- B. Examine walls upon which base will be installed.
 - 1. Verify wall is flat and acceptable for base application.
 - 2. Review manufacturer’s Fabrication and Installation Check List.
- C. Coordinate with responsible entity to correct unsatisfactory conditions.
- D. Commencement of work by installer is acceptance of conditions.

3.02 INSTALLATION

- A. Install fabricated items according to material manufacturers printed instructions.
- B. Set all items square and true with edges of face joints smooth, even, neat and tight against other materials.

3.03 PROTECTION, REPAIRING AND CLEANING

- A. Replace damaged and defective work.
- B. Clean according to manufacturer's directions. Use no acids or harsh abrasives.

END OF SECTION 06 61 18

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SECTION 07 42 13

METAL WALL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Exposed-fastener, lap-seam solid and perforated metal wall panels.
- B. Related Sections:
 - 1. Division 05 Section "Cold-Formed Metal Framing" for support framing, including girts, studs, and bracing.

1.03 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete wall system.

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.05 SUBMITTALS

- A. Submit in accord with the general requirements of this contract.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.
- C. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

- 1 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2
2 inches per 12 inches:
3 a. Flashing and trim.
4 b. Anchorage systems.
5
6 D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color
7 finishes.
8
9 1. Include similar Samples of trim and accessories involving color selection.
10 2. Include manufacturer's color charts consisting of strips of cured sealants showing the
11 full range of colors available for each sealant exposed to view.
12
13 E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size
14 indicated below:
15
16 1. Metal Panels: Minimum 10 x 10 inches.
17 2. Trim and Closures: 10 inches long. Include fasteners and other exposed accessories.
18 3. Accessories: 10-inch- long Samples for each type of accessory.
19 4. Exposed Sealants: For each type and color of joint sealant required. Install joint
20 sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material
21 matching the appearance of metal-faced composite wall panels adjacent to joint
22 sealants.
23
24 F. Delegated-Design Submittal: For metal wall panel assembly indicated to comply with
25 performance requirements and design criteria, including analysis data signed and sealed by the
26 qualified professional engineer responsible for their preparation.
27
28 G. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are
29 shown and coordinated with each other, using input from installers of the items involved:
30
31 1. Wall panels and attachments.
32 2. Girts or sub-framing.
33 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
34 4. Penetrations of wall by pipes and utilities.
35
36 H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
37 testing agency, for each product.
38
39 I. Maintenance Data: For metal wall panels to include in maintenance manuals.
40
41 J. Warranties: Samples of special warranties.
42
43 1.06 QUALITY ASSURANCE
44
45 A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
46
47 B. Source Limitations: Obtain each type of metal-faced composite wall panel from single source
48 from single manufacturer.
49
50 C. Preinstallation Conference: Conduct conference at Project site.
51
52 1. Meet with Owner, Architect, metal wall panel installer, metal wall panel
53 manufacturer's representative, structural-support Installer, and installers whose work
54 interfaces with or affects metal wall panels.
55 2. Provide in place mock up with all finish conditions for Architect review. Acceptable
56 mock up construction may become part of the finished construction.

1 3. Examine support conditions for compliance with requirements, including alignment
2 between and attachment to structural members.

3
4 1.07 DELIVERY, STORAGE, AND HANDLING

5
6 A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be
7 damaged or deformed. Package metal-faced composite wall panels for protection during
8 transportation and handling.

9
10 B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending,
11 warping, twisting, and surface damage.

12
13 C. Store metal wall panels horizontally vertically on platforms or pallets, covered with suitable
14 weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive
15 slope for drainage of water. Do not store metal wall panels in contact with other materials that
16 might cause staining, denting, or other surface damage. Do not allow storage space to exceed
17 120 deg F.

18
19 D. Retain strippable protective covering on metal-faced composite wall panel for period of panel
20 installation.

21
22 1.08 PROJECT CONDITIONS

23
24 A. Weather Limitations: Proceed with installation only when existing and forecasted weather
25 conditions permit assembly of metal wall panels to be performed according to manufacturer's
26 written instructions and warranty requirements.

27
28 B. Field Measurements: Verify locations of structural members and wall opening dimensions by
29 field measurements before metal wall panel fabrication and indicate measurements on Shop
30 Drawings.

31
32 1.09 COORDINATION

33
34 A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction
35 of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive
36 installation.

37
38 1.010 WARRANTY

39
40 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
41 replace components of metal wall panel assemblies that fail in materials or workmanship within
42 specified warranty period.

43
44 1. Failures include, but are not limited to, the following:
45 a. Structural failures, including rupturing, cracking, or puncturing.
46 b. Deterioration of metals and other materials beyond normal weathering.

47
48 2. Warranty Period: Two years from date of Substantial Completion.

49
50 B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer
51 agrees to repair finish or replace metal wall panels that show evidence of deterioration of
52 factory-applied finishes within specified warranty period.

53
54 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
55 a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
56 b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

1 c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2
3 2. Finish Warranty Period: 20 years from date of Substantial Completion.

4
5 1.011 ENVIRONMENTAL REQUIREMENTS

6
7 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
8 (defined as inside the weatherproofing system and applied on site) must not exceed the following
9 requirements.

10 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
11 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
12 date January 7, 2005.

13 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36,
14 requirements in effect on October 19, 2000.

15
16 PART 2 - PRODUCTS

17
18 2.01 PANEL MATERIALS

19
20 A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with
21 temper as required to suit forming operations and structural performance required

22
23 1. Surface: Smooth, flat finish.

24 2. Exposed Coil-Coated Finish:

25 a. 3-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than
26 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply
27 coating to exposed metal surfaces to comply with coating and resin manufacturers'
28 written instructions.

29
30 B. Aluminum Metal Plate

31 1. Aluminum Material: Tension-leveled,

32 2. 70% Fluoropolymer PVDF painted finish, 3003-H14 manganese alloy.

33 3. Thickness: 0.080 inch.

34 4. Weight: Less than 2 lbs per sf.

35
36 C. Aluminum Tapered Rib

37 1. Formed with raised, trapezoidal ribs.

38 2. Material:

39 a. Aluminum sheet, .040 inch thick; smooth.

40
41 3. Exterior Finish:

42 a. 70 percent; 3-coat fluoropolymer.

43
44 D. Panel Sealants:

45 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound
46 sealant tape with release-paper backing. Provide permanently elastic, nonsag,
47 nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

48 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant;
49 of type, grade, class, and use classifications required to seal joints in metal wall panels
50 and remain weathertight; and as recommended in writing by metal wall panel
51 manufacturer.

52 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

53
54 2.02 MISCELLANEOUS METAL FRAMING

- 1 A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet,
2 ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance
3 unless otherwise indicated.
4
- 5 B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch nominal thickness.
6
- 7 C. Zee Clips: 0.079-inch nominal thickness.
8
- 9 D. Base or Sill Angles and Channels: 0.079-inch nominal thickness.
10
- 11 E. Hat-Shaped, Rigid Furring Channels:
12
- 13 1. Nominal Thickness: As required to meet performance requirements.
 - 14 2. Depth: As indicated or required for a complete installation.
- 15
- 16 F. Cold-Rolled Furring Channels: Minimum 1/2-inch- wide flange.
17
- 18 1. Nominal Thickness: As required to meet performance requirements, or as indicated.
 - 19 2. Depth:
 - 20 a. As indicated or required for a complete installation.
 - 21 b. Custom sizes are required.
 - 22
 - 23 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal
24 thickness of 0.040 inch.
 - 25 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-
26 diameter wire, or double strand of 0.048-inch- diameter wire.
27
- 28 G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment
29 flange of 7/8 inch, and depth required to fit insulation thickness indicated.
30
- 31 1. Nominal Thickness: As required to meet performance requirements.
- 32
- 33 H. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance,
34 holding power and other properties required to fasten miscellaneous metal framing members to
35 substrates.
36
- 37 2.03 MISCELLANEOUS MATERIALS
38
- 39 A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and
40 other suitable fasteners designed to withstand design loads. Provide exposed fasteners with
41 heads matching color of metal-faced composite wall panels by means of plastic caps or factory-
42 applied coating. Provide EPDM, PVC, or neoprene sealing washers.
43
- 44 2.04 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS:
45
- 46 A. General: Provide factory-formed, metal wall panels designed to be field assembled by lapping
47 side edges of adjacent panels and mechanically attaching panels to supports using exposed
48 fasteners in side laps. Include accessories required for complete installation.
49
- 50 B. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal ribs.
51
- 52 1. Basis-of-Design Product: Centria Architectural Systems Profile BR5-36, solid (Metal
53 Panel 2) and Ecoscreen Perforated Screenwall (Metal Panel 1).
 - 54 2. Subject to compliance with the requirements, comparable products by one of the
55 following may be provided; submit for approval:
 - 56 a. AEP-Span.

- 1 b. Architectural Metal Systems.
- 2 c. Berridge Manufacturing Company.
- 3 d. Butler Manufacturing Company
- 4 e. Copper Sales, Inc.
- 5 f. Englert, Inc.
- 6 g. Fabral.
- 7 h. McElroy Metal, Inc.
- 8 i. Metal Sales Manufacturing Corporation.
- 9 j. Metecno-Morin.
- 10 k. Petersen Aluminum Corporation.
- 11
- 12 3. Material: Aluminum sheet, .040 inch thick; smooth.
- 13 a. MP-2: Solid Panel where indicated on Drawings.
- 14 b. MP-1: Perforated Panel where indicated on Drawings.
 - 15 1) Free Area: 30 percent; 1/8-inch diameter holes spaced at 7/32 inch, on-
 - 16 center, staggered
 - 17 c. Exterior Finish: 70 percent; 3-coat fluoropolymer.
 - 18 d. Color: Color as selected by Architect from manufacturer's full range.
 - 19 e. Interior Finish: Manufacturer's standard.
- 20
- 21 4. Ribs: 1-1/2 inch deep unsymmetrical ribs spaced at 7.2 inches o.c.
- 22 a. Corners: BOD Centria MicroSeam Corners:
 - 23 1) Mitered Corners: Structurally-bonded horizontal interior and exterior
 - 24 trimless corners matching metal wall panel material, profile, and factory-
 - 25 applied finish, fabricated and finished by metal wall panel manufacturer.
 - 26 2) Welded, riveted, fastened, or field- fabricated corners do not meet the
 - 27 requirements of this specification.
- 28
- 29 5. Panel Coverage: 36 inches.

30

31 2.05 ACCESSORIES

- 32
- 33 A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly
- 34 including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets,
- 35 fillers, closure strips, and similar items. Match material and finish of metal-faced composite
- 36 wall panels unless otherwise indicated.
 - 37 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall
 - 38 panels.
 - 39 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from
 - 40 material recommended by manufacturer.
 - 41 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam
 - 42 or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips;
 - 43 cut or premolded to match metal wall panel profile. Provide closure strips where
 - 44 indicated or necessary to ensure weathertight construction.
 - 45
- 46 B. Provide integral drainage system and manufactures standard extrusions at termination of
- 47 dissimilar materials.
- 48
- 49 C. Flashing and Trim: Formed from 0.032-inch- thick zinc coated (galvanized) steel sheet or
- 50 aluminum- zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim
- 51 as required to seal against weather and to provide finished appearance. Locations include, but
- 52 are not limited to, bases, drips, sills, jambs, corners, end walls, framed openings, rakes, fasciae,
- 53 parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as
- 54 adjacent metal wall panels.
- 55
- 56 D. Panel Sealants:

- 1 1. Joint Sealant: ASTM C 920; silicone sealant; of type, grade, class, and use
2 classifications required to seal joints in metal-faced composite wall panels and remain
3 weathertight; and as recommended in writing by panel manufacturer.
4 a. Non-staining type meeting ASTM C-1248.
5
6 2. Color: Custom color to match composite wall panel finish as selected by A/E.
7
8 E. Sub-girts and/or Z-furring:
9 1. Galvanized steel, minimum 20 gage, dimensions as indicated on drawings. Furring Chan-
10 nel: Provide Hat, C, U or Z type as recommended by manufacturer.
11 2. Flat Strap: At least 14 gage thick
12
13 F. Panel Fasteners: Stainless steel fasteners suitable for attaching to specified substrate. Minimum
14 3/4 inch length, with heads/integral washers a minimum of 7/16 inch diameter.
15
16 G. Pre-finished Moldings: Manufacturer's standard line of extrusions; finish to match panel, to
17 profile required on Drawings.
18
19 2.06 FINISHES
20
21 A. Comply with NAAMM's - Metal Finishes Manual for Architectural and Metal Products, for
22 recommendations of designating finishes.
23
24 B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured
25 polyvinylidene fluoride (PVDF) resin system.
26 1. Three-Coat Fluoropolymer: AAMA 2605, fluoropolymer finish containing not less
27 than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare,
28 pre-treat, and apply coating to exposed metal surfaces to comply with coating and
29 resin manufacturers' installation instructions.
30 2. Custom color as selected by Architect.
31
32 C. Field Touch-Up Materials: As recommended by coating manufacturer for field application.
33
34 2.07 FABRICATION
35
36 A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent
37 possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated
38 performance requirements demonstrated by laboratory testing. Comply with indicated profiles
39 and with dimensional and structural requirements.
40
41 B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel
42 and with joints between panels designed to form weathertight seals.
43
44 C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length
45 of panel.
46
47 D. As applicable, fabricate metal wall panel joints with factory-installed captive gaskets or
48 separator strips that provide a tight seal and prevent metal-to-metal contact, and that will
49 minimize noise from movements within panel assembly.
50
51 E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in
52 SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and
53 other characteristics of item indicated.
54

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate non-moving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal-faced composite wall panel manufacturer for application, but not less than thickness of metal being secured.

2.08 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal-faced composite wall panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal-faced composite wall panel manufacturer.
 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of panels before panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions.

1 3.03 METAL WALL PANEL INSTALLATION

2
3 A. General: Install metal wall panels according to manufacturer's written instructions in
4 orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and
5 subgirts unless otherwise indicated. Anchor panels and other components of the Work securely
6 in place, with provisions for thermal and structural movement.

- 7
8 1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence
9 of factory-authorized representative.
10 2. Shim or otherwise plumb substrates receiving metal wall panels.
11 3. Install screw fasteners in predrilled holes.
12 4. Locate and space fastenings in uniform vertical and horizontal alignment.
13 5. Install flashing and trim as metal wall panel work proceeds.
14 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices
15 and end laps to avoid a four-panel lap splice condition.
16 7. Apply elastomeric sealant continuously between metal base channel (sill angle) and
17 concrete, and elsewhere as indicated or, if not indicated, as necessary for
18 waterproofing.
19 8. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping
20 screws. Fasten flashings and trim around openings and similar elements with self-
21 tapping screws.
22

23 B. Fasteners:

- 24
25 1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces
26 exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces
27 exposed to the interior.
28

29 C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates,
30 protect against galvanic action as recommended by metal-faced composite wall panel
31 manufacturer.
32

33 D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for
34 weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and
35 sealants indicated or, if not indicated, types recommended by panel manufacturer.
36

- 37 1. Seal metal wall panel end laps with double beads of tape or sealant, full width of
38 panel. Seal side joints where recommended by metal wall panel manufacturer.
39 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section
40 "Joint Sealants."
41

42 E. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped
43 joint at location and spacing recommended by manufacturer.

- 44 1. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items
45 for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
46 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather
47 side of metal wall panels.
48 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use
49 proper tools to obtain controlled uniform compression for positive seal without rupture
50 of washer.
51 4. Install screw fasteners with power tools having controlled torque adjusted to compress
52 washer tightly without damage to washer, screw threads, or panels. Install screws in
53 predrilled holes.
54 5. Provide sealant tape at lapped joints of metal wall panels and between panels and
55 protruding equipment, vents, and accessories.

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Miscellaneous Joints.
- B. Floor Joints (interior).
- C. Wall Joints (exterior).

1.03 RELATED WORK

- A. Section 08 11 13, Steel Doors and Frames.
- B. Section 09 29 00, Gypsum Board.

1.04 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for initial selection: Manufacturer's color charts.
- C. Samples for final selection: Custom color range of actual material for selection.
- D. Samples for exterior mockup selection: Custom color range of actual material installed in mockup for selection.
- E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Field-Adhesion Test Reports: For each sealant application tested.
- G. Warranties: Sample of special warranties.

1.05 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Submit quantity required by joint sealant manufacturer of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Retain subparagraph below if generic test data are acceptable.
6. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by A/E.
2. Conduct field tests for each application indicated below:
 - a. Each kind of sealant and joint substrate indicated.
 - 1) Existing masonry.
 - 2) Existing metal panel.
 - 3) Where new work abuts materials listed above.
3. Notify A/E seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

1.07 PROJECT CONDITIONS

- 1 A. Examine the joint surfaces and backing, and their anchorage to the structure, and the conditions
2 under which the joint sealer work is to be performed. Do not proceed with the joint sealer work
3 until unsatisfactory conditions have been corrected.
4
- 5 B. Do not proceed with installation of sealants under adverse weather conditions, or when
6 temperatures are below or above manufacturer's recommended limitations for installation.
7 Proceed with the work only when forecasted weather conditions are favorable for proper cure
8 and development of high early bond strength. Wherever joint width is affected by ambient
9 temperature variations, install sealants only when temperatures are in the lower third of
10 manufacturer's recommended installation temperature range.

11
12 1.08 WARRANTY

- 13
14 A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or
15 replace joint sealants that do not comply with performance and other requirements specified in
16 this Section within specified warranty period.
17 1. Warranty Period: Two years from date of Substantial Completion.
18
- 19 B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant
20 manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with
21 performance and other requirements specified in this Section within specified warranty period.
22 1. Warranty Period: Five years from date of Substantial Completion.
23
- 24 C. Special warranties specified in this article exclude deterioration or failure of joint sealants from
25 the following:
26 1. Movement of the structure caused by structural settlement or errors attributable to design
27 or construction resulting in stresses on the sealant exceeding sealant manufacturer's
28 written specifications for sealant elongation and compression.
29 2. Disintegration of joint substrates from natural causes exceeding design specifications.
30 3. Mechanical damage caused by individuals, tools, or other outside agents.
31 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric
32 contaminants.
33

34 1.09 ENVIRONMENTAL REQUIREMENTS

- 35 A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building
36 (defined as inside the weatherproofing system and applied on site) must not exceed the following
37 requirements.
38
- 39 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management
40 (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment
41 date January 7, 2005.
42 2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements
43 in effect on October 19, 2000.
44

45
46 PART 2 - PRODUCTS

47
48 2.01 MATERIALS, GENERAL

- 49
50 A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible
51 with one another and with joint substrates under conditions of service and application, as
52 demonstrated by joint-sealant manufacturer, based on testing and field experience.
53

- 1 B. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous
2 substrates, provide products that have undergone testing according to ASTM C 1248 and have
3 not stained porous joint substrates indicated for Project.
4
- 5 C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in
6 repeated contact with food, provide products that comply with 21 CFR 177.2600.
7
- 8 D. Colors of Exposed Joint Sealants: As selected by A/E from manufacturer's full range, or custom
9 colors where indicated.
10

11 2.02 SILICONE JOINT SEALANTS
12

- 13 A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade
14 NS, Class 100/50, for Use NT.
15 1. Products: Subject to compliance with requirements, available products that may be
16 incorporated into the Work include, but are not limited to, the following:
17 a. Dow Corning Corporation; 790.
18 b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
19 c. May National Associates, Inc.; Bondaflex Sil 290.
20 d. Pecora Corporation; 301 NS.
21 e. Sika Corporation, Construction Products Division; SikaSil-C990.
22 f. Tremco Incorporated; Spectrem 1.
23
- 24 B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920,
25 Type S, Grade NS, Class 100/50, for Use T.
26 1. Products: Subject to compliance with requirements, available products that may be
27 incorporated into the Work include, but are not limited to, the following:
28 a. Dow Corning Corporation; NS Parking Structure Sealant.
29 b. May National Associates, Inc.; Bondaflex Sil 728 NS.
30 c. Pecora Corporation; 311 NS.
31 d. Tremco Incorporated; Spectrem 800.
32
- 33 C. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade
34 NS, Class 25, for Use NT.
35 1. Products: Subject to compliance with requirements, available products that may be
36 incorporated into the Work include, but are not limited to, the following:
37 a. Dow Corning Corporation; 799.
38 b. GE Advanced Materials - Silicones; UltraGlaze SSG4000 or UltraGlaze
39 SSG4000AC.
40 c. May National Associates, Inc.; Bondaflex Sil 200 GPN or Bondaflex Sil 201 FC.
41 d. Polymeric Systems, Inc.; PSI-631.
42 e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
43 f. Tremco Incorporated; Proglaze SSG or Tremsil 600.
44
- 45 D. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS,
46 Class 50, for Use NT.
47 1. Products: Subject to compliance with requirements, available products that may be
48 incorporated into the Work include, but are not limited to, the following:
49 a. Tremco Incorporated; Spectrem 4TS.
50
- 51 E. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920,
52 Type S, Grade NS, Class 25, for Use NT.
53 1. Products: Subject to compliance with requirements, available products that may be
54 incorporated into the Work include, but are not limited to, the following:
55 a. Pecora Corporation; 898.

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2.03 LATEX JOINT SEALANTS

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

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc. Chem-Chal 600.
 - c. Pecora Corporation; AC-20+.
 - d. Tremco Incorporated; Tremflex 834.

2.04 PREFORMED JOINT SEALANTS

A. A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured lowmodulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

2.05 SEALANT ACCESSORIES

- A. Primer: When required, as recommended by the Sealant Manufacturer.
- 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.
- D. Joint Sealant Backing:
 1. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 2. Closed Cell Back-up (Backer Rod): ASTM C 1330, Type C.
 - a. Tremco "Closed Cell Backer Rod".
 - b. Sonneborn "Sonofoam".
 - c. W.R. Meadows "Kool-Rod".
 3. 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. Provide self-adhesive tape where applicable.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated 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.

1 3.02 JOINT PREPARATION

- 2
- 3 A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings,
4 moisture and other substances which would interfere with bond of sealant. Etch concrete and
5 masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous or glazed
6 joint surfaces as recommended by sealant manufacturer.
7
- 8 B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer.
9 Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
10

11 3.03 SEALANT APPLICATION, GENERAL

- 12
- 13 A. General: Comply with joint-sealant manufacturer's written installation instructions for products
14 and applications indicated, unless more stringent requirements apply.
- 15 B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint
16 sealants as applicable to materials, applications, and conditions indicated.
17
- 18 C. Set joint filler units at proper depth or position in the joint to coordinate with other work,
19 including the installation of bond breakers, backer rods and sealants.
20
- 21 1. Do not leave voids or gaps between the ends of joint filler units.
22 2. Do not stretch, twist, puncture, or tear sealant backings.
23 3. Remove absorbent sealant backings that have become wet before sealant application and
24 replace them with dry materials.
25
- 26 D. Install bond breaker tape wherever shown and wherever required by manufacturer's
27 recommendations to ensure that elastomeric sealants will perform properly.
28
- 29 E. Apply compound with a gun having proper size nozzle or with a knife, as required. Use
30 sufficient pressure to fill all voids and joints solid. Remove excess sealant and leave surfaces
31 smooth, neat and clean. Upon completion sealant shall have a smooth, even finish and all joints
32 shall be weathertight. All work shall be in accordance with manufacturer's printed instructions.
33
- 34 F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing
35 begins, tool sealants according to requirements specified in subparagraphs below to form
36 smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact
37 and adhesion of sealant with sides of joint.
38
- 39 1. Remove excess sealant from surfaces adjacent to joints.
40 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not
41 discolor sealants or adjacent surfaces.
42 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
43 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
44 5. Provide recessed joint configuration of recess depth and at locations indicated per
45 Figure 8C in ASTM C 1193.
46 a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
47
- 48 G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal
49 construction at perimeters, behind control joints, and at openings and penetrations with a
50 continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at
51 perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written
52 recommendations. Refer to Section 09 29 00 for product.
53

1 H. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate
2 into the voids of adjoining surfaces. Clean the adjoining surfaces by whatever means may be
3 necessary to eliminate evidence of spillage.
4

5 3.04 FIELD QUALITY CONTROL
6

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

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

9 a. Perform 5 tests for the first 1000 feet of joint length for each kind of exterior
10 sealant and joint substrate.

11 b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor
12 per elevation.
13

14 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint
15 Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in
16 ASTM C 1521.

17 a. For joints with dissimilar substrates, verify adhesion to each substrate separately;
18 extend cut along one side, verifying adhesion to opposite side. Repeat procedure
19 for opposite side.
20

21 3. Inspect tested joints and report on the following:

22 a. Whether sealants filled joint cavities and are free of voids.

23 b. Whether sealant dimensions and configurations comply with specified
24 requirements.

25 c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint
26 substrates or tore cohesively. Include data on pull distance used to test each kind
27 of product and joint substrate. Compare these results to determine if adhesion
28 passes sealant manufacturer's field-adhesion hand-pull test criteria.
29

30 4. Record test results in a field-adhesion-test log. Include dates when sealants were
31 installed, names of persons who installed sealants, test dates, test locations, whether joints
32 were primed, adhesion results and percent elongations, sealant fill, sealant configuration,
33 and sealant dimensions.

34 5. Repair sealants pulled from test area by applying new sealants following same procedures
35 used originally to seal joints. Ensure that original sealant surfaces are clean and that new
36 sealant contacts original sealant.
37

38 B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing
39 or noncompliance with other indicated requirements will be considered satisfactory. Remove
40 sealants that fail to adhere to joint substrates during testing or to comply with other requirements.
41 Retest failed applications until test results prove sealants comply with indicated requirements.
42

43 3.05 PROTECTION
44

45 A. Cure sealants in compliance with manufacturer's instructions and recommendations. Advise the
46 Contractor of procedures required for the cure and protection of joint sealers during the
47 construction period, so that they will be without deterioration or damage (other than normal wear
48 and weathering) at the time of Substantial Completion.
49
50

51

END OF SECTION 07 92 00

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SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Hollow Metal Frames.

1.03 RELATED WORK

- A. Joint Sealants: Section 07 92 00.
- B. Flush Wood Doors: Section 08 14 16.
- C. Door Hardware: Section 08 71 00.
- D. Painting: Section 09 90 00.
- E. Building in of anchors and grouting of frames in masonry construction is specified in Section 04 20 00.
- F. Electrical: Division 26, for conduit in frames for door hardware.
- G. Access Control Systems: Division 28

1.04 REFERENCES

- A. Comply with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- B. Fire-Rated Doors: Comply with NFPA 80 "Standard for Fire Doors and Windows." and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
- C. ANSI A250.3 Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
- D. ANSI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings
- E. ANSI A250.5 Accelerated Physical Endurance Test Procedure for Steel Doors, Frames, and Frame Anchors
- F. ANSI A250.6 Hardware on Steel Doors (Reinforcement --Application)
- G. ANSI A250.8 Nomenclature for Standard Steel Doors and Steel Door Frames

- 1 H. ANSI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for
- 2 Steel Doors and Frames
- 3
- 4 I. ANSI/DHI A115 Specifications for Hardware Preparations in Standard Steel Doors and Frames
- 5
- 6 J. ANSI/DHI A115.1G Installation Guide for Doors and Hardware
- 7
- 8 K. SDI-Steel Door Institute
- 9
- 10 L. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
- 11
- 12 M. ASTM A240/A240M Standard Specification for Heat-Resisting Chromium and Chromium-
- 13 Nickel Stainless Steel
- 14
- 15 N. ASTM A366 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
- 16
- 17 O. ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy,
- 18 Hot-Rolled and Cold-Rolled, General Requirements
- 19
- 20 P. ASTM A569 Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled
- 21 Sheet and Strip Commercial Quality
- 22
- 23 Q. ASTM A591 Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for light Coating
- 24 Mass Applications
- 25
- 26 R. ASTM A620 Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Drawing Quality,
- 27 Special Killed
- 28
- 29 S. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron
- 30 Alloy-Coated (Galvanealed) by the Hot-Dip Process
- 31
- 32 T. ASTM A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated
- 33 by the Hot-Dip Process
- 34
- 35 U. ASTM E2074-00 Methods of Fire Tests of Door Assemblies.
- 36
- 37 V. NFPA 80: Fire Doors and Windows.
- 38
- 39 W. NFPA-101-94: Life Safety Code.
- 40
- 41 X. NFPA 251: Fire Tests of Building Construction and Materials.
- 42
- 43 Y. NFPA 252: Fire Tests of Door Assemblies.
- 44
- 45 Z. UL 9: Fire Tests of Door Assemblies.
- 46
- 47 AA. UL 10B: Fire Tests of Door Assemblies.
- 48
- 49 BB. UL 263: Fire Tests of Building Construction and Materials.
- 50
- 51 CC. American Welding Society
- 52
- 53 1.05 SUBMITTALS
- 54
- 55 A. Submit in accordance with the General Conditions of the Contract.

- 1 1. Manufacturer's technical product data substantiating that products comply with
2 requirements.
3 2. Shop Drawings for fabrication and installation of steel doors and frames. Include details
4 of each frame type, elevations of door design types, conditions at openings, details of
5 construction, location and installation requirements of finish hardware and
6 reinforcements, and details of joints and connections. Show anchorage and accessory
7 items.
8 a. Provide schedule of doors and frames using same reference numbers for details
9 and openings as those on contract drawings.
10 b. Indicate coordination of glazing frames and stops with glass and glazing
11 requirements.
12 c. Submittal to include fully coordinated installation of Detail 4A715 to provide 90
13 degree angle of hold open door.
14
15 3. Oversize Construction Certification: For assemblies required to be fire rated and exceeding
16 limitations of labeled assemblies.
17
18 4. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
19 testing agency, for each type of hollow metal door and frame assembly.
20

21 1.06 QUALITY ASSURANCE

- 22
23 A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
24

25 1.07 DELIVERY, STORAGE, AND HANDLING

- 26
27 A. Deliver hollow metal work cartoned or crated to provide protection during transit and job
28 storage.
29 1. Provide additional protection to prevent damage to finish of factory-finished units.
30
31 B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to
32 jambs and mullions.
33
34 C. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided
35 refinished items are equal in all respects to new work and acceptable to Construction Manager;
36 otherwise, remove and replace damaged items as directed.
37
38 D. Store doors and frames at building site under cover. Place units on minimum 4 inch high wood
39 blocking. Avoid use of non-vented plastic or canvas shelters which could create a humidity
40 chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4
41 inch spaces between stacked doors to promote air circulation.
42

43 1.08 PROJECT CONDITIONS

- 44
45 A. Examine the openings and conditions under which hollow metal work is to be installed. Do not
46 proceed with the work until unsatisfactory conditions have been corrected.
47

48 PART 2 - PRODUCTS

49
50 2.01 MANUFACTURERS, HOLLOW METAL

- 51
52 A. Amweld Building Products
53
54 B. Ceco Door Products
55

- 1 C. Curries Company
- 2
- 3 D. Kewaunee Corporation
- 4
- 5 E. Mesker Door, Inc.
- 6
- 7 F. Steelcraft
- 8
- 9 G. Or approved equal.

10
11 2.02 MATERIALS

- 12
- 13 A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for
- 14 exposed applications.
- 15
- 16 B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale,
- 17 pitting, or surface defects; pickled and oiled.
- 18
- 19 C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill
- 20 phosphatized.
- 21 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008 or
- 22 ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- 23
- 24 D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- 25
- 26 E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated,
- 27 fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching
- 28 hollow metal frames of type indicated.
- 29
- 30 F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C
- 31 143/C 143M.
- 32
- 33 G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of
- 34 fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum
- 35 flamespread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for
- 36 combustion characteristics.
- 37
- 38 H. Glazing: Comply with requirements in Division 08 Section "Glazing."
- 39
- 40 I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film
- 41 thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur
- 42 components, and other deleterious impurities.
- 43
- 44 J. Steel: Commercial quality, level, cold-rolled steel conforming to ASTM A366, free of scale and
- 45 surface defects. Commercial quality hot rolled and pickled steel conforming to ASTM A569
- 46 may be used as option for interior frames. Standard hollow metal frame gauges are as follows
- 47 (Bullet Resistant must meet specified resistance level):
- 48 1. Interior Frames: 16-gage.
- 49 2. Exterior Frames: 14-gage.
- 50 3. Flush Doors: 16-gage (exterior), 18-gage (interior).
- 51 4. Rough Bucks and Stiffeners: 12-gage.
- 52 5. Miscellaneous Trim: 16 gage.

53
54 2.03 FABRICATION, GENERAL

- 1 A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal
2 to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and
3 assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify
4 work that cannot be permanently factory assembled before shipment.
5
6 B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
7
8 C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-
9 rolled steel sheet.
10
11 D. Provide proper Underwriters' Laboratory (UL) labels. Labeled doors shall have equal labeled
12 frames.
13
14 E. Clearances
15 1. Edge clearances shall be provided as follows:
16 a. Between doors and frame, at head and jambs - 1/8 inch.
17 b. At door sills:
18 1) Where no threshold is used - 3/8 minimum.
19 2) Where threshold is used - 1/4 inch maximum between door & threshold.
20
21 F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware;
22 include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware
23 Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
24 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
25 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door
26 hardware.
27 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series
28 specifications for preparation of hollow metal work for hardware.
29 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26
30 Sections.
31
32 G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners
33 of stops and moldings with butted or mitered hairline joints.
34 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal
35 work. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each
36 glazed lite is capable of being removed independently.
37 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and
38 frames.
39 3. Provide loose stops and moldings on inside of hollow metal work. Coordinate rabbet width
40 between fixed and removable stops with type of glazing and type installation indicated.
41

42 2.04 HOLLOW METAL FRAME FABRICATION

- 43
44 A. Provide metal frames of the types and styles indicated on the drawings or schedules and
45 complying with SDI for materials and construction requirements.
46
47 B. Provide metal frames for doors, transoms, sidelights, borrowed lites, and other openings, as
48 shown on drawings.
49
50 C. Provide integral channel frames, sub frames and stiffeners to structure where indicated or
51 required for fastening and stiffening frames.
52
53 D. Provide steel spreader temporarily attached to feet of both jambs for welded frames.
54

- 1 E. Completely clean all frames by degreasing process, followed by one coat rust inhibitive primer
2 equal to withstand a salt spray test (5% solution) of 70 hours. Thoroughly prime all surfaces
3 without runs, smears, or bare spots, and under and inside all removable stops.
4
- 5 F. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment
6 plates or angles at each joint, fabricated of same thickness metal as frames.
7
- 8 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth,
9 flush, and invisible.
 - 10 2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints,
11 fabricated from same material as door frame. Fasten members at crossings and to jambs by
12 butt welding.
 - 13 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners
14 unless otherwise indicated.
 - 15 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 16 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds
17 per anchor.
 - 18 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - 19 a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of
20 frame. Space anchors not more than 32 inches o.c. and as follows:
 - 21 1) Two anchors per jamb up to 60 inches high.
 - 22 2) Three anchors per jamb from 60 to 90 inches high.
 - 23 3) Four anchors per jamb from 90 to 120 inches high.
 - 24 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or
25 fraction thereof above 120 inches high.
 - 26
 - 27 b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of
28 frame. Space anchors not more than 32 inches o.c. and as follows:
 - 29 1) Three anchors per jamb up to 60 inches high.
 - 30 2) Four anchors per jamb from 60 to 90 inches high.
 - 31 3) Five anchors per jamb from 90 to 96 inches high.
 - 32 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or
33 fraction thereof above 96 inches high.
 - 34 5) Two anchors per head for frames above 42 inches wide and mounted in metal-
35 stud partitions.
 - 36
 - 37 c. Compression Type: Not less than two anchors in each jamb.
 - 38 d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and
39 bottom of frame. Space anchors not more than 26 inches o.c.
40
 - 41 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as
42 follows. Keep holes clear during construction.
 - 43 a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - 44 b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
 - 45

46 2.05 STANDARD HOLLOW METAL FRAMES

47

- 48 A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
49
- 50 B. Interior Frames: Fabricated from cold-rolled steel sheet.
 - 51 1. Fabricate frames with mitered or coped corners.
 - 52 2. Fabricate frames as face welded unless otherwise indicated.
 - 53 3. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
 - 54 4. Frames for Wood Doors: 0.053-inch-thick steel sheet.
 - 55 5. Frames for Borrowed Lights: Same as adjacent door frame.

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C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.06 FRAME ANCHORS

- A. 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.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. 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.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.07 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.
- D. Cut-Off Stops:
1. Angled stop terminates 6-inches above the floor, closed at a 45 degree angle.
 2. See Door Schedule for locations.

2.08 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
 2. Ensure primer is compatible with finish coats scheduled.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

1 C. Proceed with installation only after unsatisfactory conditions have been corrected.

2
3 3.02 PREPARATION

4
5 A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding,
6 filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

7
8 B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness,
9 alignment, twist, and plumbness to the following tolerances:

10 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb
11 perpendicular to frame head.

12 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane
13 of wall.

14 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines,
15 and perpendicular to plane of wall.

16 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to
17 floor.

18
19 C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door
20 hardware.

21
22 3.03 INSTALLATION

23
24 A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place;
25 comply with Drawings and manufacturer's written instructions.

26
27 B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with
28 ANSI/SDI A250.11.

29 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent
30 anchors are set. After wall construction is complete, remove temporary braces, leaving
31 surfaces smooth and undamaged.

32 a. At fire-protection-rated openings, install frames according to NFPA 80.

33 b. Where frames are fabricated in sections because of shipping or handling limitations,
34 field splice at approved locations by welding face joint continuously; grind, fill, dress,
35 and make splice smooth, flush, and invisible on exposed faces.

36 c. Install frames with removable glazing stops located on secure side of opening.

37 d. Install door silencers in frames before grouting.

38 e. Remove temporary braces necessary for installation only after frames have been
39 properly set and secured.

40 f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as
41 necessary to comply with installation tolerances.

42 g. Field apply bituminous coating to backs of frames that are filled with grout containing
43 antifreezing agents.

44
45 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and
46 secure with postinstalled expansion anchors.

47 a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled
48 expansion anchors if so indicated and approved on Shop Drawings.

49
50 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.

51 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between
52 frames and masonry with grout.

53 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions,
54 including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

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6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. 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.
 8. 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. Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
1. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 2. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels.
 3. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
 4. Install fire-rated frames in accordance with NFPA Std. No. 80.
 5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with self-tapping screws.
 6. Fill heads of fasteners with body putty, grind smooth and touch-up prime.
- D. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
- E. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.
- F. Install glazing in strict accordance with fire resistant glazing material manufacturer's specifications. Field cutting or tampering is not permissible.
- 3.04 ADJUSTING AND CLEANING
- A. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
 - B. Remove grout and other bonding material from hollow metal work immediately after installation.
 - C. Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

END OF SECTION 08 11 13

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SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED WORK

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. This section includes the following:
 - 1. Access doors and frames.
- B. Related sections include the following:
 - 1. Division 23 Section "Duct Accessories" for duct access doors.

1.03 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.
 - 1. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following
 - a. Method of attaching door frames to surrounding construction.
 - b. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, and special trim.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-site must meet the limitations and restrictions concerning chemical components set by the following standards:
 - 1. Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints", Second Edition, January 7, 1997. For applications on ferrous metal substrates.
 - 2. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on January 1, 2004.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Access Doors:
 - a. Bar-Co, Inc. Div.; Alfab, Inc.
 - b. Cesco Products.

- c. J. L. Industries, Inc.
- d. Karp Associates, Inc.
- e. Milcor Limited Partnership.

2.02 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 zinc-iron-alloy (galvannealed); stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- D. Stainless Steel: Type No. 304 stainless steel with No. 4 satin polish.
- E. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.03 PAINT

- A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."
- B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

2.04 ACCESS DOORS AND FRAMES

- A. Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Various locations and surfaces, assembly to be manufactured for specific applications.
 - 2. Sizes: 18" x 18" or as shown in drawings.
 - 3. Door: Sheet metal, gauged to door size, minimum 20 gauge metal set flush with surrounding finish surfaces.
 - 4. Frame: To be manufactured specifically for the surrounding material for flush/integral installation, minimum 16 gauge metal flange.
 - a. Drywall bead for gypsum board.
 - b. Fire Rated doors to be place in fire rated assemblies or as noted on drawing.
 - 1) All fire rated doors to maintain at least a minimum of the hour rating of the assembly into which it is placed.
 - 2) Fire doors shall have automatic closure, be self latching, and contain interior latch release.

- 1 c. Other as needed.
- 2
- 3 5. Hinges:
- 4 a. Spring-loaded concealed pin type.
- 5
- 6 6. Latch:
- 7 a. Screwdriver-operated cam latch.
- 8 b. Key operated security lock.
- 9
- 10 2.05 FABRICATION
- 11
- 12 A. General: Provide access door assemblies manufactured as integral units ready for installation.
- 13
- 14 B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials
- 15 with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam
- 16 marks, roller marks, rolled trade names, or roughness.
- 17
- 18 C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces.
- 19 Furnish attachment devices and fasteners of type required to secure access panels to types of
- 20 supports indicated.
- 21
- 22 D. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge
- 23 trim for gypsum board securely attached to perimeter of frames.
- 24
- 25 E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when
- 26 closed.
- 27
- 28 F. All access doors to be fabricated and properly installed in such a manner as to maintain the fire
- 29 rating of the assembly into which it is placed.
- 30
- 31 G. UL listed for use in fire rated partitions if required by the application.
- 32
- 33 2.06 FINISHES, GENERAL
- 34
- 35 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
- 36 recommendations for applying and designating finishes.
- 37
- 38 B. Finish metal fabrications after assembly.
- 39
- 40 2.07 METALLIC-COATED STEEL FINISHES
- 41
- 42 A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with
- 43 applicable standard listed below:
- 44 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
- 45 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- 46
- 47 B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and
- 48 other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited
- 49 to the organic coating to be applied over it. For metallic-coated surfaces, clean welds,
- 50 mechanical connections, and abraded areas, and apply galvanizing repair paint specified below
- 51 to comply with ASTM A 780.
- 52 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel,
- 53 complying with SSPC-Paint 20.
- 54
- 55 C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and
- 56 pre-treating.

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- D. Stainless Steel: Type No. 304 stainless steel with No. 4 satin polish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install according to manufacturer's instructions.
 - 1. Doors to be installed plumb/level/square as surfaces require.
 - 2. Maintain even gap between frame and door.
- B. Stainless steel access panels are to be installed for use in toilets, showers, similar wet areas and in any space in the Autopsy Suite proper.

3.02 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.
- C. Remove all packaging material upon completion.

END OF SECTION 08 31 13

SECTION 08 52 00

ALUMINUM-CLAD WOOD WINDOWS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern the work under this section.

1.02 WORK INCLUDED

- A. This Section includes operable aluminum-clad, wood-framed windows of the following type:
1. Aluminum-clad, wood windows.

1.03 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:
1. AW: Architectural.
 2. HC: Heavy Commercial.
 3. C: Commercial.
 4. LC: Light Commercial.
- B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:
1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide wood windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of test size indicated below:
1. Size required by AAMA/WDMA 101/I.S.2/NAFS for gateway performance.
 2. Size indicated on Drawings.
- B. Structural Performance: Provide wood windows capable of withstanding the effects of the following loads based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.
- C. Windborne-Debris Resistance: Provide glazed windows capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506 and requirements of authorities having jurisdiction.

1.05 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of wood window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
 - 1. Joinery details.
 - 2. Expansion provisions.
 - 3. Flashing and drainage details.
 - 4. Weather-stripping details.
 - 5. Thermal-break details.
 - 6. Glazing details.
 - 7. Window cleaning provisions.
- C. Qualification Data: For installer and manufacturer.
- D. Warranty: Special warranty specified in this Section.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating wood windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- C. Source Limitations: Obtain wood windows through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for wood windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of wood windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements." Do not modify size and dimensional requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- F. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Provide AAMA or WDMA-certified wood windows with an attached label.
- G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify wood window 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 wood windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of wood, metals, vinyl, other materials, and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: Ten years from date of Substantial Completion.
 - b. Glazing: Insulating glass shall be warranted against visible obstruction thru the glass caused by a failure of the insulating glass air seal for a period of twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Clad Wood Windows: Jeld-Wen, "Siteline Wood Awning Window" or equal by:
 - a. Marvin
 - b. Andersen Windows, "Architectural Series".
 - c. Loewen.
 - d. Pella Corporation.

2.02 WOOD WINDOWS

- A. Window Type: Awning as indicated on Drawings.
- B. Material: Western Pine, preservative treated with AuraLast by JELD-WEN, Inc. in accordance with WDMA I.S.4.
- C. Exterior: Extruded aluminum, .050" (1.3) thick.
 - 1. Finish: Two coat finish system using Kynar® or Hylar® resins, meets or exceeds AAMA 2605 requirements.
 - a. Color selected by A/E from manufacturer's full line.
- D. Interior: Pine or Vertical Grain Douglas Fir.
 - 1. Pre-finished stain.
- E. Performance Requirements: Window units shall be designed to comply with ANSI / AAMA / NWWDA 101 / I.S.2-97 and 101 / I.S. 2/ NAFS-02 C-C40 rating.
 - 1. Casement: C-C50 rating up to CN 3672, C-C65 rating up to CN 2872
- F. Performance Class: AW.
- G. Air Infiltration: Air leakage shall not exceed the following when tested at 6.24 psf according to ASTM E 283: 0.30 cfm per square foot of frame.
- H. Water Resistance: No water penetration when tested at the following pressure according to ASTM E 547: C-R40-6.0 psf, C-C50-7.5 psf, C-C65-9.75 psf.
- I. Test Pressure: Assembly shall withstand a positive or negative uniform static air pressure difference of C-R40-60 psf, C-C50-75 psf, C-C65-97.5 psf. without damage when tested according to ASTM E 330.

- J. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 588.
- K. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.
- L. Provide all exterior trim to match existing adjacent windows.
- M. Provide all sealant and weatherstripping for a complete installation.

2.03 GLAZING

- A. Glass: Clear, insulating-glass units, argon gas filled, with low-E coating pyrolytic on second surface or sputtered on second or third surface.
- B. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.04 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with wood; designed to smoothly operate, tightly close, and securely lock wood windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze.
- B. Hardware: Factory installed operating hardware to match existing adjacent windows.
 - 1. Manual lever.
 - a. Roto-gear with high-pressure die-cast zinc housing and steel base plate. Hardened steel worm drive and gear arms. Thermo plastic resin operator base cover. High pressure die-cast zinc crank handle.
 - 2. Locks:
 - a. One concealed lock on units smaller than series 32 height.
 - b. Two concealed tandem sequential locks on series 32 height and higher.
- C. Hardware finish: Provide bronze or oil-rubbed bronze at crank handles and lock levers.

2.05 ACCESSORIES

- A. Insect Screens: Factory installed. Screen mesh, 18 by 16: Charcoal aluminum wire. Aluminum frame finish: Match existing adjacent windows.
- B. Mullion covers:
 - 1. Aluminum extrusions as indicated on drawings.
 - 2. Profile: As selected by A/E from manufacturer's full line.
 - 3. Finish: Match exterior frame finish.

2.06 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Fabricate wood windows that are reglazable without dismantling sash or ventilator framing.
- C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.
- D. Factory machine windows for openings and for hardware that is not surface applied.
- E. Factory-Glazed Fabrication: Except for light sizes in excess of 100 united inches, glaze wood windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. 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, weathertight window installation.
 - 1. 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.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.03 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 08 52 00

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Door Hardware.

1.03 RELATED SECTIONS

- A. Finish Carpentry: Section 06 20 00.
- B. Hollow Metal Doors and Frames: Section 08 11 13.
- C. Electrical: Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance door operators and access control devices.

1.04 REFERENCES

- A. Federal Specifications (FS)
 - 1. FF-H-106a Hardware, Builders'; Locks and Door Trim-Standard Finishes for Builders Hardware.
- B. National Fire Protection Association, Inc. (NFPA), Battery March Park, Quincy, MA 02269.
 - 1. NFPA 80 - Standard for fire doors and windows.
 - 2. NFPA 101 - Code for safety to life from fire in buildings and structures.
- C. Underwriter's Laboratories, Inc. (UL), 333 Pfingsten Road, Northbrook, IL 60062.
 - 1. Building Materials Directory.
- D. Hardware shall be in strict accord with Wisconsin Administrative Code Chapter Comm. 69 - "Barrier Free Design".

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Five (5) copies of a detailed, vertical type hardware schedule for approval.
 - a. List and describe each opening separately. Include doors with identical hardware, except hand, in a single heading. Include door number, room designations, degree of swing, and hand.
 - b. List related details. Include dimensions, door and frame material, and other conditions affecting hardware.
 - c. List all hardware items. Include manufacturer's name, quantity, product name, catalog number, size, finish, attachments, and related details.
 - d. Resubmit four (4) copies of the corrected schedule when required.

- 1 e. Determine keying requirements, as directed by the Owner's Representative and submit five (5) copies
2 of a detailed keying schedule for approval; resubmit four copies (4) of the corrected schedule when
3 required.
4 f. Prior to final payment, provide a record copy of hardware schedules, including all revisions and
5 updates. All openings shall be listed to reflect final installed configuration only.
6
7 2. Samples of hardware items as may be required. Identify each sample and indicate the location of
8 subsequent installation in the project.
9 3. Provide a copy of the approved hardware schedule and all pertinent templates or template information to
10 each fabricator of material factory-prepared for the installation of hardware.
11

12 1.06 QUALITY ASSURANCE

- 13
14 A. Manufacturers and product numbers listed herein establish a standard of quality. Similar items by other
15 manufacturers may be accepted by prior written approval by the architect in accord with the General Conditions
16 of the Contract. Except where specified in the hardware schedule, furnish products of only one manufacturer
17 for each type of hardware.
18
19 B. Supplier: Hardware Supplier: The hardware supplier shall be a corporate member in good standing of The
20 Door and Hardware Institute (DHI), employing at least one Architectural Hardware Consultant (AHC) who is
21 currently participating in DHI's continuing education program (CEP).
22
23 C. Items of hardware not definitely specified herein but necessary for completion of the Work shall be provided.
24 Such items shall be of type and quality suitable to the service required and comparable to the adjacent hardware.
25 Where size and shape of members is such as to prevent the use of types specified, hardware shall be furnished of
26 suitable types having as nearly as practicable the same operation and quality as the type specified. Sizes shall
27 be adequate for the service required. Include such nuances as strike type, strike lip, raised barrel hinges,
28 mounting brackets, fasteners, shims, and coordination between conflicting products. All doors shall be
29 provided with a stop.
30

31 1.07 REGULATORY REQUIREMENTS

- 32
33 A. Furnish UL listed hardware for all UL labeled openings in conformance with requirements for the class of
34 opening scheduled.
35

36 1.08 DELIVERY, STORAGE AND HANDLING

- 37
38 A. Deliver hardware to the job site in the manufacturer's original containers marked to correspond with the
39 approved hardware schedule for installation location.
40
41 B. Store hardware in dry surroundings and protect against loss and damage.
42

43 PART 2 - PRODUCTS

44 2.01 MANUFACTURERS

- 45
46
47 A. Refer to the Hardware Schedule at the end of this Section.
48

49 2.02 ACCESSORIES

- 50
51 A. Furnish all necessary hardware accessories such as wood or machine screws, bolts, nuts, anchors, toggle bolts,
52 and other fasteners, each of the type, size, material and finish for its intended purpose and each according to the
53 material to which the hardware is being applied.

1		Best Security Corporation to accept genuine Best Access System provided		
2		cylinder core is an acceptable equal.		
3	3.	Door Closers	LCN	LCN
4	a.	Approved Equals:	No substitutions.	
5	4.	Kickplate	Rockwood Mfg. Co	ROCKWOOD
6	5.	Electric Strikes	Von Duprin	VON DUPRIN
7	a.	Approved Equals:	HES	
8			Folger Adams	
9	6.	Door Position Switch	GE	GE
10	7.	Clothes Hook	Bobrick	BBK
11	8.	Exit devices	Von Duprin	VON DUPRIN
12	a.	Approved Equals:	No substitutions.	
13	9.	Low Energy Auto. Operators:	Stanley Magic Force	STANLEY
14	a.	Approved Equals:	No substitutions.	

15
16 B. Hardware Sets:

17
18 **SET 1A**

19	1 EA	EXISTING DOOR PREP WRAP	14-2-CW	S	DON-JO
20	1 EA	STOREROOM LOCK	9K3-7-D-15D	626	BEST
21	1 EA	ELECTRIC STRIKE	6211	630	VON DUPRIN
22	1 EA	DOOR POSITION SWITCH	1078	GRY	GE

23
24 *EXISTING DOOR AND FRAME TO BE REWORKED FOR NEW HARDWARE*

25
26 **SET 1B**

27	1 EA	CYLINDER	AS REQUIRED	613	BEST
28	1 EA	ELECTRIC STRIKE	6211	613	VON DUPRIN
29	1 EA	DOOR POSITION SWITCH	1078	BRN	GE
30		CARD READER BY SECTION 28 13 00			

31
32 *EXISTING DOOR AND FRAME TO BE REWORKED FOR NEW HARDWARE*

33
34 **SET 1C**

35	1 EA	EXISTING DOOR PREP WRAP	14-2-CW	S	DON-JO
36	1 EA	STOREROOM LOCK	9K3-7-D-15D	626	BEST
37	1 EA	ELECTRIC STRIKE	6211	630	VON DUPRIN
38	1 EA	DOOR POSITION SWITCH	1078	GRY	GE
39		CARD READER BY SECTION 28 13 00			

40
41 *EXISTING DOOR AND FRAME TO BE REWORKED FOR NEW HARDWARE*

42
43 **SET 2A**

44	1 EA	STOREROOM LOCK	9K3-7-D-15D	626	BEST
45	1 EA	AUTOMATIC OPERATOR	STANLEY MAGIC FORCE		STANLEY
46	2 EA	ACTUATOR	AS REQUIRED		
47	1 EA	ELECTRIC STRIKE	6211	630	VON DUPRIN
48	1 EA	DOOR POSITION SWITCH	1078	GRY	GE
49		CARD READER BY SECTION 28 13 00			

50
51 *EXISTING DOOR TO BE REWORKED FOR NEW HARDWARE*

52
53 *OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. USE OF ACTUATOR TO*

1 *ACTIVATE AUTOMATIC OPERATOR FROM THE PUSH SIDE ALLOWED AT ALL TIMES. FROM THE PULL*
2 *SIDE, USE OF AUTHORIZED CREDENTIAL IN THE CARD READER SHALL UNLOCK ELECTRIC STRIKE*
3 *AND ALLOW USE OF ACTUATOR FOR AUTOMATIC OPERATOR. IN THE EVENT OF A FIRE OR POWER*
4 *OUTAGE, THE ELECTRIC STRIKE SHALL BECOME LATCHED AND THE AUTOMATIC OPERATOR SHALL*
5 *DEACTIVATE, CLOSING AND LATCHING THE DOOR.*

6
7
8 **SET 3A**

9	1 EA	PASSAGE LATCH	9K3-0-N-15D	626	BEST
10	1 EA	AUTOMATIC OPERATOR	STANLEY MAGIC FORCE		STANLEY
11	2 EA	ACTUATOR	AS REQUIRED		
12	1 EA	ELECTRIC STRIKE	6211	630	VON DUPRIN

13
14 *EXISTING DOOR TO BE REWORKED FOR NEW HARDWARE*

15
16 *OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LATCHED. USE OF ACTUATOR TO*
17 *ACTIVATE AUTOMATIC OPERATOR FROM EITHER SIDE ALLOWED AT ALL TIMES. IN THE EVENT OF A*
18 *FIRE OR POWER OUTAGE, THE ELECTRIC STRIKE SHALL BECOME LATCHED AND THE AUTOMATIC*
19 *OPERATOR SHALL DEACTIVATE, CLOSING AND LATCHING THE DOOR.*

20
21 **SET 4A**

22	1 EA	PASSAGE LATCH	9K3-0-N-15D	626	BEST
23	1 EA	WALL STOP	409	612	ROCKWOOD
24	1 EA	CLOTHES HOOK	B-6727	SS	BBK (DOORS 105, 106, 107, 109)

25
26 **SET 5A**

27	1 EA	STOREROOM LOCK	9K3-7-D-15D	626	BEST
28	1 EA	WALL STOP	409	612	ROCKWOOD

29
30 **SET 6A**

31	1 EA	PRIVACY LATCH	9K3-0-L-15D	626	BEST
32	1 EA	WALL STOP	409	612	ROCKWOOD

33
34
35 *END OF SECTION 08 71 00*
36

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SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Metal Studs.
- B. Gypsum Board.
- C. Trim and Accessories.
- D. Acoustical Batt Insulation.

1.03 RELATED WORK

- A. Section 09 90 00 Painting.

1.04 REFERENCES

- A. Referenced Specifications: The more stringent requirement of this section or referenced specification applies.
 - 1. "Using Gypsum Board for Walls and Ceilings", The Gypsum Association - GA-201-85.
 - 2. "Recommended Specifications for the Application and Finishing Gypsum Boards", The Gypsum Association - GA-216.
- B. Fire Rated Assemblies: Provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL, or tested in accordance with ASTM E119 for type of construction shown.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Manufacturer's product data.
 - 2. Texture finish sample.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site with manufacturer's labels intact and legible.
- B. Handle materials with care to prevent damage.
- C. Deliver fire-rated material bearing testing agency label and required fire classification numbers.
- D. Storage
 - 1. Store materials inside under cover, stack flat, off floor.

2. Stack wallboard so that long lengths are not over short lengths.
3. Avoid overloading floor system.
4. Store adhesives in dry area, provide protection against freezing at all times.

1.07 PROJECT CONDITIONS

- A. During cold weather, maintain temperature range between 55 degrees F. to 70 degrees F. for 24 hours before, during, and after gypsum board and joint treatment applications.
- B. Ventilation
 1. Provide ventilation during and following adhesive and joint treatment applications.
 2. Use temporary air circulators in enclosed areas lacking natural ventilation.
 3. Protect installed materials from drafts during hot, dry weather.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Georgia Pacific.
- B. LaFarge.
- C. National Gypsum Company, Gold Bond.
- D. United States Gypsum Company.
- E. BPB America, Inc.
- F. Chicago Metallic.
- G. Dietrich Industries.
- H. Or approved equal.

2.02 MATERIALS

- A. Gypsum Board: ASTM C 36, long edges tapered; in lengths as long as practical to keep number of end joints to absolute minimum.
 1. Regular Gypsum Board.
 2. Water Resistant Wallboard: 5/8-inch thick.
 3. Cementitious Backer Board: Aggregated, Portland cement board with woven, glass fiber, mesh facing; complying with ANSI A118.9.
 - a. Manufacturer: USG, Durock Interior Tile Backer Board or approved equal.
 - b. Thickness: 1/2 inch.
 4. Veneer Plaster Base: USG Imperial Gypsum Base, 5/8-inch thick.
 5. Fire Rated 1 Inch thick gypsum wall board panels, supplied in nominal 24 inch widths type SLX.
 6. Fire Rated Face Layer: 5/8 inch Gypsum Board:
 - a. American Gypsum; Types AGX-1, AG-C
 - b. Certaineed Gypsum; ProRoc Type C
 - c. Georgia Pacific Gypsum; Type S
 - d. USG; Type C, FRX-G, IP-X2, IPC-AR, SCX, or WRC.
 - e. Or approved equal.

B. Accessories

1. Metal Trim: USG No. 200-A.
2. L-shaped Metal Trim for Veneer Plaster: USG No. 801-B.
3. Metal Reveal Molding: Fry Reglet DRM-625-75.
4. Metal 'Z' Reveal Molding, 1/4" wide: Fry Reglet DRMZ-625-25.
5. Metal 'Z' Reveal Molding, 1" wide: Fry Reglet DRMZ-100-100.
6. Expansion Joints: USG No. 093.
7. Drywall Screws for Metal Framing: 1" Type S-12 or Type S bugle head.
8. Outside Corner Reinforcement: USG No. 104, 1-1/8" x 1-1/8" corner bead.
9. Acoustical Sealant: Equal to Tremco "Tremflex 834" or Pecora "Acoustic and Insulation Sealant", low VOC formulation.
 - a. VOC content less than 50 g/l.
10. Tie Wire: No. 18 SWG, steel wire.
11. Steel runner channel brackets: 25 MSG galvanized steel.
12. Corner angles: 25 MSG galvanized steel.
13. Sound Attenuation Blanket: U.S. Gypsum Thermafiber, or approved equal, 3" for an STC of 49.

C. Metal Studs/Resilient Furring Channels.

1. Unless indicated otherwise, use 25-gage for partitions up to 12'-0" high, use 20-gage for partitions over 12'-0" high.
2. Unless indicated otherwise, use 20-gage studs at door jambs, head.
3. Track gauge shall be same gauge as nested studs.
4. 2 1/2 inch wide by 1 1/2 inches deep C-H studs 24 inch on center. Fabricated from minimum 25 MSG galvanized steel.

D. Suspension System

1. Chicago Metallic 640 system
 - a. Hanger Wire: 8-gage, annealed.
 - b. Carrying Channels: 1-1/2 inch cold rolled steel.
 - c. Screws: USG 1-inch type S.
 - d. Furring Channels: USG metal furring channel, attached with USG furring channel clips.
2. Chicago Metallic 650 System complying with UL Design No. D502.
 - a. Hanger clips: 18 gauge galvanized steel.
 - b. Hanger wire: No. 12 SWG galvanized steel.
 - c. Carrying Channels: 16 gauge 1 1/2 inch cold rolled.
 - d. Furring Cross Channel: 16 gauge 7/8 inch where required.
 - e. Wall Molding: 26 gauge steel channel 1 11/16 inch deep with 15/16 inch flanges.
3. Or approved equal.

E. Drywall Finishing Accessories

1. Joint Compounds: Ready mixed type.
2. Joint Reinforcement: USG Perf-A-Tape or approved equivalent.

F. Patching Materials at Plaster

1. Setting-Type Joint Compounds, Base Coat: USG Sheetrock, "Durabond" or approved equal.
 - a. Low shrinkage, chemically setting compounds rated for interior and exterior use.
 - b. Suitable for heavy fills and areas of high humidity.
 - c. Compatible for use over Portland cement plaster.
2. Setting-Type Joint Compounds, Finish Coat: USG Sheetrock, Lightweight "Easy Sand" or approved equal.

- a. Low shrinkage, chemically setting compounds rated for interior and exterior use.
 - b. Suitable for heavy fills and areas of high humidity.
 - c. Compatible for use over Portland cement plaster.
- G. Texture Finish Materials
- a. Heavy roller texture at existing and new GWB surfaces.

PART 3 - EXECUTION

3.01 GYPSUM BOARD

- A. Follow Gypsum Association's recommendations for installation procedures.
- B. Cut wallboards by scoring and breaking or sawing; scribe neatly at wall projections.
- C. Apply first to ceilings then to walls.
- D. Locate wallboard joints at openings so that no end joint aligns with edge of opening.
- E. Set fasteners with heads slightly below surface of wallboard. Avoid breaking face paper.
- F. Provide water resistant wallboard at rooms/areas with high humidity.

3.02 METAL STUDS

- A. Attach metal runners at floor and at ceiling or structural elements above with suitable fasteners located 2 inches from each end, spaced 16 inches on center.
- B. Position studs vertically, engaging floor and ceiling runners. Splice studs with 8-inch nested lap, one positive attachment per stud flange. Place studs in direct contact with all door frame jambs, abutting partitions, partition corners, existing construction elements.
- C. Provide double studs at jambs and head of each door frame. Securely anchor studs to jamb and head anchor clips at metal door frames by bolt or screw attachment. Over metal frames, place a cut-to-length section of runner horizontally with web-flange bent at each end; secure with one positive attachment per flange. Position a cut-to length stud (extend to ceiling runner) at vertical board joints over door frame header. Place an additional track-to-track stud 6 inches from double jamb studs on both sides of framed openings.
- D. At curved surfaces, space studs and framing members 8 inches on center maximum.

3.03 ONE HOUR RATED ASSEMBLY

- A. Base layer: 1 inch thick gypsum board
 - 1. Vertical edges inserted into "H" section of C-H studs. Free edge of end panels attached to long leg of "J" runners with 1 5/8 inch long Type S heads steel screws spaced not greater than 12 inches on center.
- B. Steel C-H Studs:
 - 1. 24 inch on center, floor to deck. Top and bottom, free edge at adjoining surface, in "J" channel.
- C. Face layer: 5/8 inch Gypsum Board
 - 1. Applied vertically and attached to studs with 1 inch Type S steel screws spaced 12 inches on center along edges and in the field of the boards.

3.04 CEILING SUSPENSION SYSTEM

- A. Suspend carrying channels with 8-gage hanger wires spaced 48 inches on center, within 6 inches of ends.
- B. Install carrying channels 48 inches on center and within 6 inches of walls. Provide 1 inch clearance between channel ends and abutting walls, partitions.
- C. At splices, interlock flanges, overlap ends 12 inches, and secure with 16-gage double standard tie wire at each end.
- D. Erect furring channels at right angles to carrying channels, spaced 24 inches on center and within 6 inches of walls. Provide 1-inch clearance between channel ends and abutting walls, partitions.
- E. Secure to carrying channels with clips, or, saddle tie with 16-gage double standard tie wire. At splices nest channels at least 8 inches, securely wire tie at each end.
- F. Install additional cross reinforcing to restore lateral stability of suspension system at openings that interrupt carrying or furring channels.
- G. Apply wallboard of maximum practical length with long dimension at right angles to furring channels. Position and stagger end joints over channel web. Fit ends and edges closely, but not forced together.
- H. Fasten board to channels with 1-inch Type S screws spaced 12 inches on center in field of board, along abutting ends, edges.
- I. Comply with UL Design No. D502 requirements at fire rated assembly.

3.05 EXPANSION JOINTS

- A. At Ceilings: 50'-0" on center each way maximum.
- B. At Walls: 30'-0" on center maximum.
- C. Provide at intersections with exposed masonry construction.

3.06 SINGLE LAYER/ERECTION

- A. Position all ends, edges over framing members, except when edge joints are at right angles to framing members, or when end joints are back-blocked. Apply wallboard horizontally or vertically on walls to minimize the number of joints.
- B. Attach wallboard to metal framing supports by power driven screws. For vertical application space screws 12 inches on center in field of board, 8 inches on center staggered along vertical abutting edges. For horizontal application space screws 12 inches on center in field, along abutting end joints.

3.07 MULTI-LAYER WALLBOARD ERECTION

- A. Base Layer: Erected as specified for "Single Layer Erection".
- B. Joints in face layer to fall at least 10 inches from parallel joints in base layer.

- C. Apply face layers with adhesive in accordance with wallboard manufacturer's printed instructions. Provide sufficient number and spacing of fasteners to hold top layer tight with bottom layer until adhesive dries.

3.08 JOINT TREATMENT APPLICATION

- A. Mix joint compound in accordance with manufacturer's recommendations.
- B. Apply compound in thin uniform layer to all joints, angles to be reinforced. Apply reinforcing tape centered over joint, seated into compound. Follow immediately with thin skim coat or embed tape. Fold and embed tape in interior angles to provide true angle.
- C. When embedding coat is thoroughly dry, apply second coat of compound, filling board taper flush with surface. Cover tape, feather out slightly beyond tape.
- D. On joints with no taper, cover tape, feather out at least 4 inches on either side of tape.
- E. No second coat is required on interior angles.
- F. When second coat is thoroughly dry, spread finish coat evenly over and extend slightly beyond second coat. Feather to a smooth, uniform finish.
- G. Over taped edges, do not allow finish coat to protrude beyond plane of surface. Apply finish coat to cover tape, taping compound at taped angles to provide true angle. When necessary, sand between coats and follow with final coat to provide smooth surface ready for decoration.
- H. Do not abrade adjacent face-paper surfaces.
- I. Gypsum substrate where located behind dry erase wallcoverings must meet level 4 requirements: All joints and interior angles have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free from tool marks and ridges.

3.09 FINISHING FASTENERS

- A. Apply compound to fastener depressions. Follow with minimum of two additional coats leaving depressions level with surface.
- B. Do not abrade adjacent face-paper surfaces.

3.010 FINISHING BEAD AND TRIM

- A. Apply first coat to beads, trim. Properly feather out from ground to plane of surface. Embed flanges of corner reinforcement with compound.
- B. When embedding coat is thoroughly dry, apply second coat in same manner as first-coat, extending compound slightly beyond onto face of board.
- C. When second coat is thoroughly dry, apply finish coat extending compound slightly beyond second coat, properly feathering from ground to plane of surface. Sand finish coat as necessary to provide flat smooth surface, ready for decoration.

D. Do not abrade adjacent face-paper surfaces.

3.011 ACOUSTIC SEALANT

A. Apply sealant at intersections of wallboard and adjacent materials to form a complete seal to air and noise.

3.012 ADJUST AND CLEAN

A. Ridging

1. Sand ridges to reinforcing tape without cutting through tape.
2. Fill concave areas on both sides of ridge with topping compound.
3. After fill is dry, blend in topping compound over repaired area.

B. Fill cracks with compound and finish smooth and flush.

END OF SECTION 09 29 00

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SECTION 09 30 00

TILING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Wall Tile
- B. Floor Tile
- C. Base Tile
- D. Transition Strips

1.03 RELATED WORK

- A. Gypsum Board, Section 09 29 00,

1.04 REFERENCES

- A. The following specifications and standards are incorporated by reference:
 - 1. Tile Council of America, Inc. - "Handbook for Ceramic Tile Installation".

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Samples for colors on 12 inch by 12 inch panels in duplicate for tile specified.
 - 2. Samples in duplicate for each different trim piece required.
 - 3. Grout samples in duplicate indicating color range anticipated, texture.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, handle, deliver and store at the job site in original unbroken containers in a manner that will avoid damage or contamination.
- B. All containers shall bear grade seals, manufacturer's name, size, color and quantities.

1.07 PROJECT CONDITIONS

- A. Set and grout tile when ambient temperature is at least 50 degrees F. and rising.

1.08 EXTRA MATERIALS

- A. Deliver stock of extra materials to Owner. Furnish extra materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Furnish one box for each type, color, pattern and size installed.

1
2 PART 2 - PRODUCTS

3
4 2.01 TILE

5
6 A. Floor tile.

- 7 1. FT-1: Porcelain Tile
8 a. Atlas Concorde USA Forge
9 b. Color: to be selected from manufacturer's full range.
10 c. Sizes 12"x24"
11 d. Installation: Random staggered brickwork pattern.
12 e. Provide 6" tile cove base in restrooms (BT-1).

13
14 B. Wall Tile

- 15 1. WT-1: Porcelain Tile
16 a. United States Ceramic Tile Color Collection
17 b. Color: to be selected from manufacturer's full range, gloss finish.
18 c. 2"x8"
19
20 2. WT-2: Porcelain Tile
21 a. Crossville Color By Numbers
22 b. Color: to be selected from manufacturer's full range, gloss finish.
23 c. 4"x 12"

- 24
25 C. The above is used as the basis of design. Approved equal by Dal Tile, Ceasar Ceramics USA or approved
26 equal.

27
28 2.02 SETTING MATERIALS

29
30 A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

- 31 1. Prepackaged dry-mortar mix containing dry, re-dispersible, ethylene vinyl acetate additive to which
32 only water must be added at Project site.
33 2. Prepackaged dry-mortar mix combined with acrylic resin liquid-latex additive.
34 a. For wall applications, provide non-sagging mortar that complies with Paragraph F-4.6.1 in
35 addition to the other requirements in ANSI A118.4.

36
37 2.03 ACCESSORIES

- 38
39 A. Portland Cement: ASTM C 150, type 1.

- 40
41 B. Sand: ASTM C-144.

- 42
43 C. Water: Clean and potable.

- 44
45 D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces,
46 specifically approved for materials and installations indicated by tile and grout manufacturers.

- 47
48 E. Grout:

- 49
50 1. Bostik TrueColor grout.
51 2. Tec Powergrout mortar and primer.
52
53 3. Non-sanded (Selected as per tile manufacturer's recommendation)

- 1 a. Color: To be selected by AE from manufacturer's full range of colors.
- 2
- 3 4. Sanded (Selected as per tile manufacturer's recommendation)
- 4 a. LATICRETE "Tri-Poly Fortified Sanded Grout (1500 Series)"; Bostik Findley "Hydroment
- 5 Ceramic Tile Grout (sanded)"; or approved equal.
- 6 b. Color: To be selected by AE from manufacturer's full range of colors.
- 7
- 8 F. Acrylic Additive: LATICRETE "1776 Grout Admix Plus"; Chargar Corporation "Acryl 60" or approved
- 9 equal.
- 10
- 11 G. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation
- 12 provided or approved by manufacturer of tile-setting materials for installations indicated.
- 13
- 14 H. Provide other materials not specifically described but required for a complete and proper installation.
- 15
- 16 I. Transition Strips:
- 17
- 18 1. Tile to carpet
- 19 a. Manufacturer: Schluter
- 20 b. Profile: Schluter -Schiene
- 21 c. Material: Stainless steel
- 22 d. Size according to materials used with approval of A/E.
- 23
- 24 2. Or approved equal.
- 25
- 26 J. Sealer
- 27 1. Product: Dupont Stonetech Professional Heavy Duty Grout Sealer
- 28

29 PART 3 - EXECUTION

30

31 3.01 EXAMINATION

32

- 33 A. Examine surfaces where tile is to be applied and notify the Contractor of any defects.
- 34

35 3.02 INSTALLATION

36

37 A. General

- 38 1. Provide all proper installation methods for freezing climate.
- 39 2. Installation and workmanship shall be in accordance with ANSI A108.1 and as specified herein. The
- 40 printed instructions of the tile manufacturer and the manufacturer of proprietary mortars and grouts
- 41 shall be followed where applicable.
- 42 3. Before commencing work, establish field pattern and border line locations.
- 43 4. Center the work symmetrically so that no tile need be cut to less than half size.
- 44 5. Joints in wall tile shall be aligned vertically and horizontally; staggered joints will not be accepted.
- 45 6. Align joints when adjoining tiles on floor, base and trim are the same size.
- 46 7. Rub exposed edges smooth.
- 47

- 48 B. Interior Wall Tile Setting Bed: TCA W202/Tile backer board substrates - acrylic modified latex-cement
- 49 mortar.
- 50

- 51 C. Handle, store, mix and apply proprietary setting and grouting materials in compliance with the manufacturer's
- 52 instructions.
- 53

- 1 D. Extend tile work into recesses and under equipment and fixtures to form a complete covering without
2 interruptions, except as otherwise shown.
3
4 E. Terminate work neatly at obstructions, edges, and corners without disruption of pattern or joint alignments.
5
6 F. Comply with manufacturer's instructions for mixing and installation of proprietary materials.
7
8 G. Neutralize and seal substrates in accordance with setting bed manufacturer's instructions, where required.
9
10 H. Jointing Pattern: Grid pattern.
11
12 I. Expansion, Control Joints
13 1. Extend completely through tile mortar bed. Insert preformed back-up material to provide correct
14 cavity depth for sealant.
15 2. Width of expansion, control joints: Same as tile joints.
16 3. Prior to grouting, keep expansion and control joints open and clean.
17 4. After tile is grouted and completely dry, remove temporary filler material. Brush joints clean, fill
18 expansion and control joints.
19
20 J. Seal as per manufacturers requirements.

21
22 3.03 CLEANING

- 23
24 A. After completion, clean all work, point open joints and replace defective work.
25

26 3.04 PROTECTION

- 27
28 A. Close off work spaces to traffic during installation and at least 48 hours after completion of work.
29
30 B. Tiled vertical outside corners shall be protected with board corner strips in areas used as passageways.
31
32

33 END OF SECTION 09 30 00
34

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Acoustical Board.
- B. Suspension Systems.

1.03 RELATED WORK

- A. Fire Suppression: Division 21.
- B. Heating, Ventilating and Air Conditioning: Division 23.
- C. Electrical: Division 26.

1.04 SUBMITTALS

- A. Submit in accord with the General Conditions of the Contract.
 - 1. Manufacturer's product specifications and installation instructions for each acoustical ceiling material and suspension system required, including certified laboratory test reports.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened, protective packaging, with manufacturer's labels indicating brand name, pattern, size and thickness as applicable, legible and intact.
- B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.
- C. Store cartons open at each end to stabilize moisture content and temperature.

1.06 PROJECT CONDITIONS

- A. Do not install interior acoustical ceilings until space is enclosed and weatherproof. Complete installation of damp materials before beginning work.
- B. Maintain humidity of 65 - 75 percent in areas where acoustical materials are to be installed 24 hours before, during, and after installation.
- C. Maintain a uniform temperature in the range of 55 to 70 degrees F. prior to and during installation of materials.

1.07 EXTRA MATERIALS

- A. In accord with General Conditions of the Contract, deliver extra materials equal to a minimum of 50 square feet of each type of acoustical material supplied.
- B. All cartons shall be new, unopened, packaged with protective covering for storage, and identified with appropriate labels.

PART 2 - PRODUCTS

2.01 BOARD TYPE 1

- A. Lightly textured nodular lay-in panels, 3/4" thick x 2' x 2', Reveal edge (tegular), White. UL Classified Noise Reduction Coefficient (NRC) .60, Ceiling Attenuation Class (CAC) 35, Light Reflection Coefficient .82, "BioShield", 15 year warranty against sag, 82% recycled content.
- B. Celotex Brand, "Cashmere".
- C. Or approved equal by Armstrong World Industries, Ecophon Certaineed, or USG.

2.03 INTERMEDIATE DUTY SUSPENSION SYSTEM TYPE 1

- A. Armstrong, "Prelude ML, 15/16" Exposed Tee".
 - 1. Material: Hot-dipped, galvanized steel.
 - 2. Surface Finish: Baked polyester paint.
- B. Or approved equal by Chicago Metallic, National Rolling Mills, Donn/USG.
- E. Conform to all requirements of ASTM C-635 intermediate structural classification.
- F. Provide flat white finish, 15/16" face.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Do not begin installation until sufficient materials to complete a room are received.
- B. Install materials in accordance with manufacturer's printed instructions, governing regulations, fire resistance rating requirements, and industry standards applicable to work.
- C. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.
- D. Symmetrically locate grid layout in each space. Coordinate work with other trades so that lighting fixtures, grilles, and other ceiling fixtures work with grid layout.

- E. Do not use universal splices or other splices which would obstruct passage of recessed lighting fixtures through grid openings or limit fixture relocation upon flanges of ceiling grids.
- F. Support suspension system from structure above, not from ductwork, metal deck, equipment or piping.
- G. Space hangers not more than 6 inches from ends and not more than 4 feet on center.
- H. Install edge moldings at the perimeter of each acoustical ceiling area and at locations where edge of units would otherwise be exposed.
 - 1. Secure moldings to building construction by fastening with screw anchors into the substrate, through holes drilled in vertical leg. Space holes not more than 3 inches from each end and not more than 16 inches on center along each molding.
 - 2. Level moldings with ceiling suspension system, to a level tolerance of 1/8 inch in 12 feet.
 - 3. Miter corners of moldings accurately to provide hairline joints, securely connected to prevent dislocation. Cope exposed flanges of intersecting suspension system members, so that flange faces will be flush.
 - 4. Furnish additional tees for supporting grilles, diffusers and light fixtures. Refer to the reflected ceiling, HVAC and electrical plans for locations.
 - 5. Provide tegular edge at walls, other abutting vertical surfaces.
 - 6. Field paint cut edges to match surface color and sheen.
- I. Arrange acoustical units and orient directionally-patterned units, if any, in manner shown on reflected ceiling plans.

3.03 CLEANING

- A. Clean exposed surfaces of acoustical ceilings, trim, edge moldings, and suspension members to comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
- B. Remove work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.04 PROTECTION

- A. Provide required protection for the acoustical ceilings, including temperature, humidity limitations and dust control so that the work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION 09 51 00

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SECTION 09 65 00
RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Resilient Base.
- B. Resilient Flooring.
- C. Accessories.
- D. Subfloor Preparation.

1.03 RELATED WORK

- A. Selective Structure Demolition: Section 02 41 19.
- B. Carpet (vinyl and metal reducers): Section 09 68 00.

1.04 QUALITY ASSURANCE

- A. Provide each type of resilient flooring and accessories from a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
- B. Installers Qualifications: Installer experienced (minimum of 2 years) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to the product manufacturer.
- C. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer of the primary materials.
 - 1. Comply with applicable regulations regarding VOC (volatile organic compound) content of adhesives.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Manufacturer's technical data for each type of resilient flooring and accessory.
 - a. Data indicating adhesive and accessories meet VOC requirements.
 - 2. Manufacturer's standard color charts in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.
 - 3. Submit samples of metal edge strips.
 - 4. Two copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns, and quality designations legible and intact.
- B. Store and protect materials in accordance with manufacturer's recommendations.

1.07 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65 degrees F and maximum temperature of 90 degrees F in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Subsequently, maintain minimum temperature of 55 degrees F in areas where work is completed.
- B. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation.
- C. Install resilient flooring and accessories after other finishing operations, including painting, have been completed.
- D. Do not install resilient flooring over concrete slabs until they have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.
- E. Close areas to traffic and to other work until flooring is firmly set. Tile shall have 72 hours with no traffic.
- F. Where solvent based adhesives are used, provide safety sparkproof fans when natural ventilation is not adequate.

1.08 WARRANTY

- A. Provide current, detailed manufacturer's warranty for each flooring product as applicable including limited wear, defect and conductivity.
- B. Provide manufacturer's standard one-year warranty against defects in manufacturing and workmanship of resilient flooring products. Provide manufacturer's standard limited wear warranty/conductivity warranty as specified under each product as applicable.

1.09 EXTRA MATERIALS

- A. Deliver stock of extra materials to Owner. Furnish extra materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Furnish one box for each type, color, pattern and size installed.

1.010 ENVIRONMENTAL REQUIREMENTS

- A. Low-Emitting Materials, Adhesives, and Sealants: Materials used on the interior of the building (defined as inside the weatherproofing system and applied on site) must not exceed the following requirements.
 - 1. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management (SCAQMD) Rule # 1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.

2. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36, requirements in effect on October 19, 2000.

PART 2 - PRODUCTS

2.01 RESILIENT FLOOR

- A. Shaw Hard Surface® is used as the basis of design. Armstrong, or approved equal.
- B. RF-1 Product:
 1. Style Name/Number: Pigment
 2. Color: to be selected from manufacturer's full range.
 3. Construction: High Performance Luxury Vinyl Tile.
 4. Direct glue down
 5. Overall Thickness: 2.5mm.
 6. 20 mil wear layer.
 7. Nominal Dimensions: 7"x48"
 8. 10 year limited commercial wear warranty and 10 year under bed warranty.
 9. Class III printed film vinyl plank
 10. Added antimicrobial: Flor Sept™
 11. Finish: ExoGuard™
 12. Backing Class: Commercial Grade.
 13. Slip Resistance/ASTM D2047: >0.65 (wet/dry).
 14. Static Load Limit/(Modified ASTM F970: 1500 psi.
 15. Passes ASTM F1914 Residual Indentation <8%
 16. Passes ASTM F137 Flexibility
 17. Passes ASTM G21 0: Fungi free.
 18. Passes ASTM F 1514 Resistance to Heat.
 19. Passes ASTM F 1515 Resistance to Light.
 20. Passes ASTM F 925 Resistance to Chemicals.
 21. Passes ASTM 648, Radiant Flux, > 0.45 watts/cm² NFPA Class 1
 22. Passes ASTM E662, Smoke Density, < 450.
- C. Installation pattern to be provided by Architect with a pattern containing (1) color.

2.02 RESILIENT WALL BASE

- A. General: Rubber, cove base, top set, roll stock.
 1. Height: 4"
 2. Color: to be selected from manufacturer's full range
- B. Manufacturers: Armstrong (colors to be selected from manufacturers' full range) or approved equal by:
 1. Flexco.
 2. Freudenberg Building Systems, Nora.
 3. Johnsonite.
 4. Roppe.

2.03 ACCESSORIES

- A. Adhesives: Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions; equal to HENRY GreenLine GL33High-Performance VCT Adhesive, low VOC type.
- B. Resilient tile flooring adhesive Basis of Design: Shaw 4100 or S150
 - a. VOC content: <0.5 grams/liter

- b. Refer to manufacturer's installation instructions
- C. Adhesive for Wall Base: W.W. Henry "595 Cove Base Adhesive", zero-VOCs; W.F. Taylor "2035 Cove Base Adhesive" or "2040 Premium Cove Base Adhesive", GreenGuard certified; PL Adhesives & Sealants "Cove Base Adhesive"; Bostik Findley, Durabond "D-740 Multipurpose Wall Adhesive".
 - 1. Low-VOC type: VOC content less than 100 g/l.
- D. Concrete Slab Primer: Non-staining, low-VOC type, equal to W.F. Taylor Co. "Envirotec Healthguard" #2006, as approved by flooring and underlayment manufacturers.
- E. Patching, Leveling, Underlayments: The leveling materials must be portland cement based and provide a minimum 3,500 PSI compressive strength (ASTM C 109) and sufficient bond to existing subfloor surface.
 - 1. Ardex, Laticrete, Duralox, Mapei, or equivalent, approved by flooring manufacturer.
- F. Metal Edge Strip: Similar to Ceramic Tile Company CTC1132CTA.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The subfloor must be prepped to meet the requirements as described in the manufacturer's installation instructions.
 - 1. Rough up smooth epoxy surfaces to accommodate resilient flooring manufacturer's installation requirements.
- B. A clean non-burnished concrete surface free from any paint, wax, oil, grease, and film forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds is required. The surface should not have any alkaline salts, laitance, mold, mildew, residual adhesive, chemical adhesive removers or anything that may prevent appropriate products bonding to it. If not then the general contractor should provide the mechanical means to remove them. This could be dustless diamond grinding (Diamabrush), bead-blast or similar with a suitable HEPA vacuum attachment. Review and comply with all relevant local, state and federal regulations.
- C. Clean out and fill or repair any dormant saw cuts and cracks with an appropriate product following the manufacturers written usage instructions. For any expansion (moving) joints, use an industry standard expansion joint assembly.
- D. When required, use a leveler following the manufacturers written instructions. The surface should be free of dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that may interfere with the bond. These should be completely removed by mechanical means only. Dustless diamond grinding or bead blasting are the preferred method to remove contaminants and bond breakers, as it also helps to level the concrete.
- E. Perform mat bond tests in each major area (1 per ~1,000 sq. ft.) This should consist of the proposed subfloor preparation, mitigation and leveling or smoothing products. Do not proceed with installation until all the results of the bond test are acceptable.
- F. Prime the subfloor prior to using a suitable leveler, as approved by the resilient flooring manufacturer.
- G. Vacuum floors immediately prior to installing the flooring to remove all loose particles. If required, only use water based sweeping compounds. Do not use any wax or oil based compounds that leave behind a residue that may interfere with the adhesive bond.

- H. Perform moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compound. Do not use curing compounds on concrete subfloors.
- I. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory. Indicate adverse conditions of any type by letter.

3.02 PREPARATION

- A. Comply with ASTM F 710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring, and manufacturer's recommendations for surface preparation. Remove substances incompatible with resilient flooring adhesive by method acceptable to manufacturer.
 - 1. Concrete floors with steel troweled (slick) finish shall be properly roughened (sanded) to ensure suitable adhesion.
 - 2. Concrete floors with curing, hardening and/or breaking compounds shall be abraded with mechanical methods only to remove compounds.
 - a. Do not use chemicals for removal.
 - b. Do not use wax or oil based sweeping compounds.
- B. Sand or grind subfloors to remove mortar, paint, other surface irregularities.
- C. Where filling, patching, leveling is required of thickness exceeding 1/8-inch apply latex type underlayment in two or more applications. Apply compound in accordance with manufacturer's printed instructions.
- D. Remove all debris, sand, and other materials which would result in lack of adhesion and/or star cracking.

3.03 INSTALLATION

- A. Areas of the flooring that are subject to direct sunlight through doors or windows should have them covered using blinds, curtains, cardboard or similar for the time of the installation and 72 hours after the installation to allow the adhesive to cure. Note: These areas should be installed using wet adhesives only.
- B. Install resilient flooring, including but not limited to the following, in accordance with the manufacturer's installation instructions.
 - 1. Do not mix manufacturing batches of a color within the same area.
 - 2. Do not install resilient flooring over building expansion joints.
 - 3. Do not install defective or damaged resilient flooring.
 - 4. Layout resilient flooring to provide ~equal size at perimeter. Adjust layout as necessary to reduce the amount of resilient flooring which is cut to less than half full width.
 - 5. Lay resilient flooring with arrows in the same direction (excluding borders).
 - 6. Install resilient flooring without voids at seams. Lay seams together without stress.
 - 7. Cut/scribe resilient flooring neatly at perimeter and obstructions.
 - 8. Extend resilient flooring into reveals, closets, and similar openings.
 - 9. Remove excess adhesive immediately.
- C. Install reducer strips at exposed edges.
- D. Prevent all traffic for a minimum of 12 hours and rolling loads for 72 hours to allow the adhesive to cure. If required, after 12 hours protect the flooring from damage during construction operations using Masonite, plywood or a similar product, ensuring first that the flooring surface is free of all debris. Lay panels so that the

edges form a butt joint and tape the joint to prevent both movement and debris entrapment underneath them. Inspect immediately before covering and after removal for final acceptance.

3.04 WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required.
- B. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Cut no shorter than full wall length.
- C. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
 - 1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 2. Adhesive shall cover a minimum of 90 percent of ribbed back of base.
 - 3. Leave 1/4 inch uncovered space at top edge of base to prevent oozing.
 - 4. Roll base firmly, roll back toward starting point.

3.05 CLEANING

- A. Perform following operations immediately upon completion of resilient flooring.
 - 1. Have the flooring cleaned no sooner than 72 hours after the installation using the method approved by the manufacturer's maintenance recommendations.
 - 2. Touch-up and repair any minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

3.06 PROTECTION

- A. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.

END OF SECTION 09 65 00

SECTION 09 68 00

CARPET

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Standard Commercial Carpet.
- B. Floor Filler.
- C. Adhesives.

1.03 RELATED WORK

- A. Related Sections include the following:
 - 1. Section 02 41 19: "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 65 00: "Resilient Flooring" for resilient wall base installed with carpet.

1.04 REFERENCES

- A. Carpet shall be in strict accord with Wisconsin Enrolled Commercial Building Code, Chapter 11 - "Accessibility".
- B. Carpet and Rug Institute (CRI).

1.05 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, fade resistance and printed statement of VOC content.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet: 12-inch square, (2) Samples.
 - 2. Exposed Edge, Transition, and other Accessory Stripping: 6-inch long, (2) Samples.
- C. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet, 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.
- D. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.08 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet 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. Floors must be free of dust, oils, grease, or other foreign matter.
- D. Allow installation to cure for a minimum of 24 hours before subjecting it to any traffic, moving of furniture, or other heavy equipment.

1.09 WARRANTY

- A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet 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, and delamination.
 - 3. Warranty Period: Lifetime.

1.010 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet: Full-sized Tiles equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.01 STANDARD COMMERCIAL CARPET TILES

- A. Products: Subject to compliance with requirements, provide a 50/30/20 blend of the following, submit shop drawings for pattern approval:
 - 1. Carpet, CPT-1:
 - a. Carpet Tile
 - b. Manufacturer: Shaw
 - c. Collection: Beyond the Fold
 - d. Style: Folded Edge, Folded, Expand
 - 1) Installation Method to be selected by Architect from manufacturer's recommendations.
 - 2) Color: to be selected from manufacturer's full line.
 - e. Size: 18"x36"
 - f. Backing: EcorWorx® Tile

- g. Weight: 24 oz tufted weight
- h. Dye Method: 77% solution dyed/23% Yard Dyed
- i. Fiber: eco solution q nylon
- j. Protective treatment: ssp shaw soil protection
- k. Or approved equal.

B. Characteristics: All carpet shall be same mill run throughout.

2.02 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining pressure sensitive 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. VOC Limits: Provide adhesives that comply with the following limits for VOC content when calculated according to 40CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 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.
 - a. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
 - 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- 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 manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.03 INSTALLATION

- A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:
 - 1. Pressure sensitive adhesive LokDots.
- B. Maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. It door openings install adapters/transitions/reducers to be covered by door when in the closed position.
 - 2. Level adjoining border edges.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet 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 manufacturer.
- E. Install metal transition strip with anchoring leg under carpet where carpet abuts ceramic tile.
 - 1. Secure metal transition strip to substrate according to manufacturer's instructions.
- F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. 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.
- H. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.
- I. 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.
 - 1. Fit edges together with an invisible seam and bond with appropriate adhesive.

3.04 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 manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet 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 manufacturer and carpet adhesive manufacturer.

END OF SECTION 09 68 00

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Painting and finishing of interior and exterior exposed items and surfaces throughout Project.
- B. Refinishing of existing surfaces as indicated on Drawings, including removal of paint and finishes, preparation, painting and finishing.
- C. Field painting of exposed bare and covered pipes and ducts and hangers, conduits, uni-strut, exposed steel and iron work, all metal fabricated Section 05 50 00 items, and primed metal surfaces including but not limited to, hollow metal work, equipment installed under mechanical and electrical work.
- D. "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.
- E. Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas.
- F. 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.

1.03 RELATED WORK

- A. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
- B. Examine the Contract Documents and be familiar with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of other Sections shall be painted or finished as part of this Section.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract:
 - 1. 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.

2. If manufacturer to be used is different from that of color chips furnished, prepare and submit two approximately 6 inch square, properly labeled samples of each color and sheen required on properly prepared paint-out cards or hardboard.
3. Stain: Two, 6 inch square properly labeled samples of each color and sheen required on actual wood for project.
4. 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 A/E. When approved, interior surface shall become acceptable standard of finish quality and workmanship for similar on-site repainting work.

1.05 QUALITY ASSURANCE

A. 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".

1.06 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 job site in original, new and unopened packages and containers bearing manufacturer's name and label.
- C. Store materials not in actual use in tightly covered containers.
- D. Take all precautions to ensure that workers and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.
- E. Remove rags and waste from storage areas daily.

1.07 PROJECT CONDITIONS

- A. Apply water-base paints only when temperatures of surfaces to be painted and surrounding air temperatures are between 50 and 95 degrees F.
- B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F. and 95 degrees F.
- C. Do not apply paint when relative humidity exceeds 85%; at temperatures less than 5 degrees F. above the dew point; or to damp or wet surfaces.

1.08 SEQUENCING AND SCHEDULING

- A. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto newly-painted surfaces.

- 1 1.09 EXTRA MATERIALS
2
3 A. Furnish extra materials described below that are from same production run (batch mix) as materials
4 applied and that are packaged for storage and identified with labels describing contents.
5
6 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color
7 applied.
8
- 9 1.010 ENVIRONMENTAL REQUIREMENTS
10
11 A. Low-Emitting Materials, Field applied Paints and Coatings: Interior paints and coatings applied on-
12 site must meet the limitations and restrictions concerning chemical components set by the following
13 standards:
14 1. Topcoat Paints, Green Seal Standard GS-11, Paints: First Edition, May 20, 1993.
15 2. Anti-Corrosive and Anti-Rust Paints: Green Seal Standard GS-03, Anti-Corrosive Paints",
16 Second Edition, January 7, 1997. For applications on ferrous metal substrates.
17 3. "All Other Architectural Coatings, Primers and Undercoats: South Coast Air Quality
18 Management District (SCAQMD) Rule #1113, Architectural Coatings", rules in effect on
19 January 1, 2004.
20
- 21 PART 2 - PRODUCTS
22
- 23 2.01 MANUFACTURERS
24
25 A. AFM Safecoat.
26
27 B. Benjamin Moore & Co.
28
29 C. Cabot.
30
31 D. ICI/Dulux.
32
33 E. PPG Architectural Finishes, Inc.
34
35 F. Sherwin Williams Company.
36
37 G. U-C Coatings Corp.
38
39 H. Target Coatings
40
41 I. Diamond Vogel Paint
42
43 J. Or approved equal.
44
- 45 2.02 MATERIALS
46
47 A. Use the materials of the same manufacturer for each system.
48
49 B. Sherwin Williams systems are called out in the system schedules to establish quality and dry mil
50 thickness of finished installation for all systems. A different manufacturer may be used for color
51 selection. Any manufacturer noted above may be used as long as quality and color requirements are
52 met.
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- 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) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
 - 1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
 - 2. Non-flat Paints and Coatings: 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: Paints and coatings shall not contain any of the following:
 - 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.

1 F. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

2

3 2.03 PRIMERS/SEALERS

4

5 A. Interior Latex Primer/Sealer: MPI #50.

6

7 2.04 METAL PRIMERS

8

9 A. Rust-Inhibitive Primer (Water Based): MPI #107.

10

11 2.05 LATEX PAINTS

12

13 A. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).

14

15 B. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).

16

17 C. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).

18

19 D. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

20

21 2.06 EQUIPMENT

22

23 A. Provide all brushes, rollers, ladders, scaffolding, and other equipment of any kind to properly
24 execute each type of work.

25

26

27 PART 3 - EXECUTION

28

29 3.01 EXAMINATION

30

31 A. Examine substrates and conditions, with Applicator present, for compliance with requirements for
32 maximum moisture content and other conditions affecting performance of work.

33

34 B. Maximum Moisture Content of Substrates:

35

36 1. Gypsum Board: 12 percent.

37

38 2. Concrete: Must be cured a minimum of 45 days.

39

40 C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes
41 and primers.

42

43 D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are
44 dry.

45

46 1. Beginning coating application constitutes Contractor's acceptance of substrates and
47 conditions.

48

49 3.02 PREPARATION

50

51 A. Perform preparation and cleaning procedures in accord with paint manufacturer's instructions and as
52 specified for each particular substrate condition.

53

54 1. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and
similar items in place and not to be finish-painted, or provide surface-applied protection prior
to surface preparation and painting operations.

55

a. After completing painting operations, use workers skilled in the trades involved to
reinstall items that were removed. Remove surface-applied protection if any.

- 1 b. Do not paint over labels of independent testing agencies or equipment name,
2 identification, performance rating, or nomenclature plates.
3
- 4 2. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and
5 grease prior to mechanical cleaning.
6 3. Remove dirt, rust, scale, moisture, scuffed surfaces, or conditions otherwise detrimental to
7 formation of a durable paint film.
8
- 9 B. New wood: Prepare substrate and apply finish according to manufacturer's recommendations. Apply
10 to smooth clean surfaces only.
11
- 12 C. Gypsum Board: Fill minor irregularities with patching material and sand to smooth level surfaces
13 taking care not to raise nap of paper.
14
- 15 D. Existing Ferrous Metal
16 1. Spot remove failed, damaged or rough existing paint to bare metal by means of stripping as
17 indicated above. If existing metal surface is not smooth, sand or wire brush.
18 a. Sand edges of existing paint to a feather edge.
19 2. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer
20 and clean cloths.
21
- 22 E. Ferrous Metal
23 1. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer
24 and clean cloths.
25 2. Where not galvanized, shop coat of primer will exist on surface. If prime coat is not smooth,
26 sand to bare metal and re-prime.
27
- 28 3.03 APPLICATION
29
- 30 A. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse
31 humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.
32
- 33 B. Do work under adequate illumination and dust-free conditions.
34
- 35 C. Apply paints according to manufacturer's written instructions.
36 1. Use applicators and techniques suited for paint and substrate indicated.
37 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
38 Before final installation, paint surfaces behind permanently fixed equipment or furniture with
39 prime coat only.
40 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged
41 items to match exposed surfaces.
42
- 43 D. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same
44 material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient
45 difference in shade of undercoats to distinguish each separate coat.
46
- 47 E. Materials
48 1. Do not open containers until required for use.
49 2. Stir materials thoroughly and keep at uniform consistency during application.
50
- 51 F. Coats
52 1. Number specified is minimum.
53 2. Touch up suction spots between coats.
54 3. If undercoats or other conditions show through topcoat, apply additional coats until cured
55 film has a uniform paint finish, color, and appearance.

- 1 4. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush
2 marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines
3 and color breaks.
- 4 5. Refinish surfaces affected by refitting work.

5
6 3.04 COLOR SEPARATION

- 7
- 8 A. An average of one or two wall colors will be used per room. Ceilings generally will be a different
9 color than walls. Finished closets will usually be same as adjoining rooms.
- 10
- 11 B. Job painted metal items such as diffusers, grilles and registers will generally be same color as
12 adjacent surface.
- 13
- 14 C. Hardwood generally will be the same color stain throughout.

15
16 3.05 CLEANING

- 17
- 18 A. During the progress of this work, remove from the site all discarded paint materials, rubbish, cans
19 and rags at the end of each work day.
- 20
- 21 B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove
22 spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise
23 damage finished surfaces.

24
25 3.06 PROTECTION

- 26
- 27 A. Protect work of other trades, whether to be painted or not, against damage by painting and finishing
28 work. Correct damage by cleaning, repairing or replacing.
- 29
- 30 B. Provide "wet paint" signs to protect newly-painted finishes. Remove temporary protective
31 wrappings, after completion of painting operations.
- 32
- 33 C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted
34 surfaces.

35
36 3.07 SCHEDULE OF INTERIOR WORK

- 37
- 38 A. In addition to obvious surfaces, the following do not require painting or finishing.
 - 39 1. Do not include painting when factory-finishing or installer-finishing is specified for such
40 items as (but not limited to) acoustic materials, finished mechanical and electrical equipment
41 including light fixtures and distribution cabinets.
 - 42 2. Painting is not required on surfaces such as walls or ceilings in concealed areas and generally
43 inaccessible areas, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 - 44 3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and
45 similar finished materials will not require finish painting, unless otherwise indicated.
 - 46 4. Moving parts of operating units, mechanical and electrical parts, such as valve and damper
47 operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish
48 painting, unless otherwise indicated.
 - 49 5. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory
50 Mutual, or any equipment identification, performance rating, name or nomenclature plate.
 - 51 6. N/A indicates system not applicable to this Project.
- 52
- 53 B. Walls and Ceilings
 - 54 1. Paint all rooms listed on Room Finish Schedule. Paint patched walls from 90 degree corner
55 and patched ceilings complete.

2. Do not apply next coat until previous is thoroughly dry.
3. Provide final coat which is solid and even in color, free from runs, laps, sags, brush marks, air bubbles and excessive roller stipple and worked into crevices, joints and similar areas.

C. Wood:

1. Apply finishes to all areas as shown on drawings.
2. Apply per manufacturer's instructions.

D. Electrical Panel Box Covers and Doors

1. Remove, paint and reinstall after paint is dry.

E. Other Unfinished and Primed Surfaces

1. Provide specified finish on exposed surfaces. This includes prime coated mechanical units, piping, pipe covering, conduit, and interior duct surfaces visible behind grilles.

F. Material	Type	Number and Type of Coating
1. IPS 4 - Wood	Stain (Satin)	One coat "Sherwood Wiping Stain", 2 coats "Wood Classics Fast Dry Varnish".
2. IPS 6 – Gypsum Board (restrooms)	Epoxy-Gloss	One coat "ProMar Primer" Two coats "Pro Industrial Pre-Catalyzed Epoxy".
3. IPS 7 - Gypsum Board	Latex-Eggshell Zero-VOC	One coat "Harmony Interior Latex Primer", Two coats "Harmony Interior Latex Eggshell".
4. IPS 9A – Concrete Block Garage Base	Epoxy-Gloss	One Coat "ProMar Primer" Two coats "Pro Industrial Pre-Catalyzed Waterbased Epoxy".
5. IPS 13 - Ferrous Metal Metal (Unprimed)	Epoxy -Semi-gloss	One coat "Pro Industrial Pro-Cryl Primer", Two coats "Pro Industrial Pre-Catalyzed Waterbased Epoxy".
6. IPS 14 - Ferrous Metal (Primed)	Epoxy -Semi-gloss	One coat "Pro Industrial Pro-Cryl Primer", Two coats "Pro Industrial Pre-Catalyzed Waterbased Epoxy".
7. IPS 15 - Copper/Alum (Finished Rooms Only)	Latex-Flat	One coat "DTM Acrylic Primer Finish", two coats "ProMar 200 Interior Latex Flat".
8. IPS 16 - Galvanized (Finished Rooms Only)	Latex-Flat	One coat "DTM Acrylic Primer Finish", two coats "ProMar 200 Interior Latex Flat".

3.08 SCHEDULE OF EXTERIOR WORK

A. General

1. Paint or finish other new, unfinished and primed surfaces noted on drawings.
2. Provide aggregate in quantity as recommended by manufacturer and mix according to manufacturer's written instructions.

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B.	Material	Type	Number and Type of Coating
1.	EPS 1 - Ferrous Metal (i.e., hollow metal, exposed plates, angles, bolts, etc.)	Acrylic-Semi Gloss	One coat "Kem-Kromik Universal" primer, two coats "DTM Acrylic".
2.	EPS 2 - Galvanized Metal (i.e., hollow metal, equipment housings, etc.)	Acrylic-Semi Gloss	One coat "Pro-Cryl Univeral" primer, two coats "DTM Acrylic".
3.	EPS 4 - Wood Siding	Stain	Prime Coat all surfaces with Sikkens "Cetol 1" prior to installation, and two coats Sikkens "Cetol 23 Plus" translucent satin stain after installation.

3.09 PAINT COLOR SCHEDULE

Refer to A900 for paint color locations, colors to be provided by Architect.

END OF SECTION 09 90 00

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SECTION 10 14 00
INFORMATION SPECIALTIES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Accessibility Signage.

1.03 REFERENCES

- A. All signage shall be in strict accord with Wisconsin Enrolled Commercial Building Code.

1.04 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
1. Manufacturer's Literature: Materials description, colors, and application instructions.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide protective coverings for identifying devices prior to shipping.
B. Handle and store to prevent damage and soiling.

PART 2: PRODUCTS

2.01 ADA REQUIRED ACCESSIBILITY SIGNAGE

- A. All interior signage must have tactile/Braille lettering and raised pictograms. Braille must be integral to the sign. Taped on Braille is not acceptable.
1. All Braille to be located at the bottom of the sign.
2. When the word "accessible" is used on a sign or when the symbol for accessibility is used, the word accessible must be included in the Braille text.
- B. Basis of Design: Interior Signs.
1. 2/90 Sign Systems
a. 6"x9" ADA Signage to meet ANSI A117.1
2. Colors: 2, to be selected by Architect from Manufacturer's full line.
- C. Manufacturers
1. ASI Sign Systems.
2. Poblocki Sign Company
3. Best Sign Systems Inc.
4. 2/90 Sign Systems
5. Or approved equal.

1 PART 3: EXECUTION

2

3 3.01 INSTALLATION

4

5 A. Comply with manufacturer's specifications and recommendations for the installation of identification devices.

6

7 C. Install devices plumb, level and true to line.

8

9 3.02 CLEANING

10

11 A. Clean surfaces of identifying devices, dedication plaque and surrounding surfaces.

12

13 B. Remove protective Coatings, if any.

14

15 3.03 SIGNAGE SCHEDULE

16

17 A. Provide ANSI A117.1 compliant signage at each door leading to an accessible restroom or shower room (i.e.,
18 all restrooms and all shower rooms). Provide graphic for shower, both gender symbols for unisex
19 designation, accessible graphic and text indicating shower or restroom.

20

21

22

END OF SECTION 10 14 00

SECTION 10 28 00

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 WORK INCLUDED

- A. Commercial Toilet and Bath Accessories.
- B. Coat Hooks.

1.03 RELATED WORK

- A. Gypsum Board, Section 09 29 00.
- B. Finish Carpentry, Section 06 20 00.

1.04 REFERENCES

- A. All work of this section shall be in strict accord with Wisconsin Enrolled Commercial Building Code.

1.05 SUBMITTALS

- A. Submit in accordance with the General Conditions of the Contract.
 - 1. Manufacturer's product data.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packaging with seals unbroken and bearing manufacturer's name and product.
- B. Store all materials in secure place to prevent damage.
- C. Remove all damaged materials from project immediately.

PART 2 - PRODUCTS

2.01 COMMERCIAL TOILET ACCESSORY MANUFACTURERS

- A. American Specialties, Inc.
- B. Bobrick Washroom Equipment, Inc.
- C. Bradley Corporation.
- D. Gamco.
- E. McKinney/Parker.

1
2 2.02 MANUFACTURED COMMERCIAL UNITS
3

4 A. Grab Bars.

- 5 1. Bradley, Model SA70, Grab Bars, lengths as indicated in drawings.
6 a. Stainless steel closure plate, suicide resistant.
7 2. Or equal by approved manufacturer.
8

9 B. Mirrors:

- 10 1. Bradley Model 781
11 a. Or approved equal
12 2. Tilt type
13 3. Stainless steel framed
14 4. Size: 18" x 60"
15

16 C. Warm-Air Dryers (DRYER):

- 17 1. Xlerator Hand Dryer
18 a. Or approved equal
19 2. Noise Reduction Nozzle
20 3. ADA Compliant Projection
21 4. Surface recessed
22 5. Operation: Electronic-sensor activated with timed power cut-off switch
23 a. Operation Time: 10 to 15 seconds
24 6. Cover Material and Finish: Steel, with black graphite epoxy finish
25 7. Electrical Requirements
26 a. 120 V, 13 A, 1500 W
27 b. Each hand dryer shall have a dedicated 20amp circuit
28

29 D. Soap dispensers

- 30 1. Owner Furnished Contractor Installed
31

32 E. Waste Receptacles

- 33 1. Owner Furnished Owner Installed, freestanding
34

35 F. Coat Hooks (also see 08 71 00 for locations)

- 36 1. B-6727 SS, Bobrick
37

38 G. Wall Hooks

- 39 1. Where "Wall Hooks" indicated on plan provide (5) B-6727, SS, Bobrick mounted on a 6"
40 nominal, 7'-7" long piece of WD-1 per specification 06 20 00. Field verify dimensions.
41

42 2.03 FASTENERS
43

44 A. Provide all fastening devices including screws, bolts, anchors, and backplates.

45 B. Exposed fasteners shall match finish of accessories.

46 C. All exposed fasteners to have tamperproof heads.
47
48
49

50 2.04 FABRICATION
51

52 A. Fabricate all toilet and bath accessories of type 302 or 304 stainless steel with satin finish, unless
53 otherwise specified or approved.
54

55 B. All accessories shall be by one manufacturer unless otherwise specified or approved.

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C. Manufacturer's labels or imprinted name shall not be visible.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and recesses to receive toilet and bath accessories for dimensions, plumbness, blocking, and other conditions that affect installation.
- B. Do not proceed until conditions are acceptable.

3.02 INSTALLATION

- A. Install toilet and bath accessories according to manufacturer's direction.
- B. All accessories in any one space shall be of matching design and finish. If discrepancies are found, secure Architect's approval before proceeding.

3.03 ADJUSTING AND CLEANING

- A. Adjust accessories for proper operation.
- B. Replace damaged or defective items.
- C. Clean and polish accessories after removing labels and protective wrapping.
- D. Delivery service and parts manual in accordance with the General Conditions of the Contract Closeout.

END OF SECTION 10 28 00

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SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

SCOPE

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:

PART 1 - GENERAL

- Scope
- Related Work Reference
- Reference Standards
- Quality Assurance
- Continuity of Existing Services
- Protection of Finished Surfaces
- Sleeves and Openings
- Sealing and Fire Stopping
- Off Site Storage
- Codes
- Design Criteria
- Certificates and Inspections
- Submittals
- Operating and Maintenance Instructions
- Training of Owner Personnel
- Record Drawings

PART 2 - PRODUCTS

- Access Panels and Doors
- Identification
- Sealing and Fire Stopping

PART 3 - EXECUTION

- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Identification
- Sleeves and Openings
- Sealing and Fire Stopping

RELATED WORK

This section applies to all Division 21 sections of fire suppression.

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

Abbreviations of standards organizations referenced in this and other sections are as follows:

- AGA American Gas Association
- ANSI American National Standards Institute
- ASME American Society of Mechanical Engineers
- ASPE American society of Plumbing Engineers
- ASTM American Society for Testing and Materials
- AWWA American Water Works Association

- 1 AWS American Welding Society
- 2 CGA Compressed Gas Association
- 3 CS Commercial Standards, Products Standards Sections, Office of Engineering Standards Service,
- 4 NBS
- 5 EPA Environmental Protection Agency
- 6 FM FM Global
- 7 FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
- 8 IAPMO International Association of Plumbing & Mechanical Officials
- 9 IEEE Institute of Electrical and Electronics Engineers
- 10 ISA Instrument Society of America
- 11 DSPS State of Wisconsin Dept. of Safety and Professional Services
- 12 MCA Mechanical Contractors Association
- 13 MICA Midwest Insulation Contractors Association
- 14 MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
- 15 NBS National Bureau of Standards
- 16 NEC National Electric Code
- 17 NEMA National Electrical Manufacturers Association
- 18 NFPA National Fire Protection Association
- 19 STI Steel Tank Institute
- 20 UL Underwriters Laboratories Inc.

21

22 **QUALITY ASSURANCE**

23 Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and
24 Substitutions.

25

26 All products and materials used are to be new, undamaged, clean and in good condition. Existing products
27 and materials are not to be reused unless specifically indicated.

28

29 Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings,
30 or engineering parameters from those indicated on the contract documents, the contractor is responsible for
31 all costs involved in integrating the equipment or accessories into the system and for obtaining the intended
32 performance from the system into which these items are placed.

33

34 **PROTECTION OF FINISHED SURFACES**

35 Refer to Division 1, General Requirements, Protection of Finished Surfaces.

36

37 **SLEEVES AND OPENINGS**

38 Refer to Division 1, General Requirements, Sleeves and Openings.

39

40 **SEALING AND FIRESTOPPING**

41 Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall
42 be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall
43 hire individuals skilled in such work to do the sealing and fireproofing. Provide all fire stopping of fire
44 rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire
45 Stopping.

46

47 **OFF SITE STORAGE**

48 Prior approval by DFD and the A/E will be needed. The contractor shall submit Storage Agreement Form
49 AD-BDC-74 to DFD for consideration of off site materials storage. Generally, sleeves, pipe/pipe fittings
50 and similar rough-in material will not be accepted for off site storage. No material will be accepted for off
51 site storage unless shop drawings for the material have been approved.

52

53 **CODES**

1 Comply with requirements of Wisconsin Administrative Code, Dept. of Safety and Professional Services,
2 NFPA Standards and local Fire Chief or Fire Marshal (AHJ, Authority Having Jurisdiction) regarding
3 design, materials and installation.

4
5 **DESIGN CRITERIA**

6 Design fire protection systems in accordance with codes, standards and regulations noted above.

7
8 The automatic sprinkler system for office areas, conference/meeting rooms, toilet rooms, lobby corridors
9 and similar spaces shall be designed to provide a minimum density of 0.10 gpm/sq. ft. over the
10 hydraulically most remote 1,500 sq. ft. using ½", 165 degree F. rated quick response sprinklers, while
11 allowing a 250 gpm hose stream allowance.

12
13 The automatic sprinkler system for the library book stack are shall be designed to provide a minimum
14 density of 0.20 GPM/sq.ft. over the hydraulically most remote 2,000 sq. ft. using ½" 165 degree F standard
15 sprinklers while allowing a 250 GPM hose stream allowance.

16
17 The automatic sprinkler system for mechanical rooms, storage rooms, laundry rooms and similar spaces
18 shall be designed to provide a minimum density of 0.15 gpm/sq. ft. over the hydraulically most remote
19 1,500 sq. ft. using ½", 225 degree F. rated quick response sprinklers, while allowing a 250 gpm hose stream
20 allowance.

21
22 Obtain waster supply data from Madison Water Utility.

23
24 **CERTIFICATES AND INSPECTIONS**

25 Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.

26
27 Obtain and pay for all required State or local installation inspections except those provided by the
28 Architect/Engineer . Deliver originals of NFPA test certificates and DFD test reports to the Division's
29 construction representative. Include copies of the certificates and reports in the Operating and Maintenance
30 Instructions.

31
32 **SUBMITTALS**

33 Refer to Division 1.

34
35 Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to
36 submit the following fire protection system data sheet. List piping material types, ASTM number, schedule
37 or pressure class, joint type, manufacturer and model number where appropriate. List valves, specialties
38 and equipment with manufacturer model number. The approved fire protection system data sheet(s) will be
39 made available to the Owners project representative for their use on this project.

40
41 **FIRE PROTECTION SYSTEM DATA SHEET**

42 <u>Item</u>	<u>Pipe Service/Sizes</u>	<u>Manufacturer/Model No.</u>	<u>Remarks</u>
43 Pipe			
44 Fittings			
45 Hangers & Supports			
46 Sprinkler Heads			
47 Valves			

48
49 Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material
50 index list page showing item designation, manufacturer and additional items supplied with the installation.
51 Submit for all equipment and systems as indicated in the respective specification sections, marking each
52 submittal with that specification section number. Mark general catalog sheets and drawings to indicate
53 specific items being submitted and proper identification of equipment by name and/or number, as indicated
54 in the contract documents. Include wiring diagrams of electrically powered equipment.

1
2 Submittals shall be sent to the local Fire Chief or Fire Marshal for review prior to the Architect/Engineer.
3 Include copy of all review/approval letters in submission to Architect/Engineer.
4

5 Submit plans indicating water supply location and size, piping layout and size, sprinkler locations and type,
6 hanger locations and type, equipment locations and type, valve locations and type, occupancy classes,
7 hydraulic reference points, design areas and discharge densities.
8

9 Submit hydraulic calculations for water supply and sprinkler systems. Include summary sheet and detailed
10 work sheets. Describe characteristics of water supply and location of effective point used in calculations.
11 Include graph illustration of water supply, hose demand, sprinkler demand and in-rack sprinkler demand.
12

13 Submit sufficient quantities of data sheets and shop drawings to allow the following distribution:

- 14 • Operating and Maintenance Manuals
 - 15 • Dane County Public Works 1 copy
 - 16 • Dane County Facilities Management 1 copy
 - 17 • Architect/Engineer 1 copy
 - 18 • Local Fire Chief or Marshal 1 copy
- 19

20 **OPERATING AND MAINTENANCE INSTRUCTIONS**

21 All operations and maintenance data shall comply with the submission and content requirements specified
22 under section GENERAL REQUIREMENTS.
23

24 In addition to the general content specified under GENERAL REQUIREMENTS supply the following
25 additional documentation:

- 26 • Copies of all approved submittals along with approval letters.
- 27 • Manufacturer's wiring diagrams for electrically powered equipment.
- 28 • Records of tests performed to certify compliance with system requirements.
- 29 • Certificates of inspection by regulatory agencies.
- 30 • Parts lists for equipment and specialties.
- 31 • Manufacturers installation, operation and maintenance recommendations for equipment and
32 specialties.
- 33 • Valve schedules
- 34 • Warranties
- 35 • Additional information as indicated in the technical specification sections
36

37 **TRAINING OF OWNER PERSONNEL**

38 Instruct Owner's personnel in the proper operation, maintenance and testing of systems and equipment
39 provided as part of this project. Include not less than 2 hours of instruction, using the Operating and
40 Maintenance manuals and record drawings during this instruction. Demonstrate testing, startup and
41 shutdown procedures for all equipment. All training to be during normal working hours. Video record all
42 instructions and provide Owner with copy.
43

44 **RECORD DOCUMENTS**

45 Refer to Division 1, General Requirements, Record Documents.
46

47 In addition to the data indicated in the General Requirements, maintain fire protection layout record
48 drawings and hydraulic calculations on originals prepared by the installing contractor/subcontractor.
49 Include copies of these record drawings and calculations with the Operating and Maintenance manuals.
50

51 **PART 2 - PRODUCTS**

52 **ACCESS PANELS AND DOORS**

53
54
55 LAY-IN CEILINGS:

1 Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration provided under Division 09 are
2 sufficient; no additional access provisions are required unless specifically indicated.

3
4 **CONCEALED SPLINE CEILINGS:**

5 Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling
6 system used will be provided under Division 09.

7
8 **METAL PAN CEILINGS:**

9 Removable sections of ceiling tile held in position by a pressure fit will be provided under Division 09.

10
11 **PLASTER WALLS AND CEILINGS:**

12 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general
13 applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver
14 operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated
15 partitions if required by the application. Use the largest size access opening possible, consistent with the
16 space and the equipment needing service; minimum size is 12" by 12".

17
18 **IDENTIFICATION**

19 **STENCILS:**

20 Not less than 1/2" high letters for pipe sizes 1" through 2-1/2" and 1 inch high letters/numbers for pipe sizes
21 3" and above for marking pipe and equipment. Apply flow arrows to piping.

22
23 **ADHESIVE LABELS:**

24 Pressure-sensitive, adhesive backed, vinyl pipe markers with applicable labeling, 3/4" min. size for lettering
25 and surrounding tape on both ends. With flow arrows on piping. Conforming to ANSI, ANSI and NFPA
26 standards. Seton Opti-Code, MSI, Brady or approved equal. Clean piping before application.

27
28 **SNAP-AROUND MARKERS:**

29 One-piece, pre-formed, vinyl construction, snap-around or strap-around pipe markers with applicable
30 labeling, 3/4" min. size for lettering. Provide nylon ties on each end of pipe marker. Seton Setmark or
31 approved equal.

32
33 **SIGNS:**

34 Metal construction, baked porcelain enamel finish signs, sizes conforming to NFPA no. 13 and 7-1.2, with
35 holes and s-hooks/chains for hanging or securing. With applicable labeling. MSI, Seton, W.H. Brady or
36 equal.

37
38 **ENGRAVED NAME PLATES:**

39 White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting,
40 Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W.
41 H. Brady.

42
43 **VALVE TAGS:**

44 Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum
45 diameter, with brass jack chains with brass "S" hooks or one piece nylon ties around the valve stem,
46 available from EMED Co., Seton Name Plate Company, MSI or W. H. Brady.

47
48 **SEALING AND FIRE STOPPING**

49 **FIRE AND/OR SMOKE RATED PENETRATIONS:**

50
51 Manufacturers: 3M, Hilti, STI/SpeSeal, Tremco, or approved equal.

52
53 All fire stopping systems shall be provided by the same manufacturer.

54

1 Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the
2 Department of Industry, Labor, and Human Relations/Dept. of Commerce.

3
4 Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product
5 characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and
6 procedures for each method of installation applicable to this project. For non-standard conditions where no
7 UL tested system exists, submit manufacturer's drawings for UL system with known performance for
8 which an engineering judgement can be based upon.

9
10 Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference
11 architectural drawings for identification of fire and/or smoke rated walls and floors.

12
13 Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop mortar, or a
14 combination of these products to provide a UL listed system for each application required for this project.
15 Provide mineral wood backing where specified in manufacturer's application detail.

16 17 **NON-RATED PENETRATIONS:**

18 19 **Pipe Penetrations:**

20 At pipe penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane
21 caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions
22 where sleeve is not required, use urethane caulk in annular space between pipe insulation and wall material.

23 24 25 **PART 3 - EXECUTION**

26 27 **CUTTING AND PATCHING**

28 Refer to Division 1, General Requirements, Cutting and Patching.

29 30 **BUILDING ACCESS**

31 Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the
32 building access was not previously arranged and must be provided by this contractor, restore any opening
33 to its original condition after the apparatus has been brought into the building.

34 35 **EQUIPMENT ACCESS**

36 Install all piping, conduit and accessories to permit access to equipment for maintenance and service.
37 Coordinate the exact location of wall and ceiling access panels and doors with the General Prime
38 Contractor, making sure that access is available for all equipment and specialties. Access doors in general
39 construction are to be furnished by the Fire Protection Contractor and installed by the General Prime
40 Contractor.

41
42 Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which
43 do not require access panels.

44 45 **COORDINATION**

46 Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that
47 interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

48
49 Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

50 51 **IDENTIFICATION**

52 Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one
53 coat of black enamel against a light background or white enamel against a dark background. Use a primer
54 where necessary for proper paint adhesion.

55
56 Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

1 Identify interior piping mains not less than once every 25 feet, not less than once in each room, adjacent to
2 each access door or panel, and on both sides of the partition where exposed piping passes through walls or
3 floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel
4 against a light background or white enamel against a dark background, or approved pipe marking label
5 systems, or provide snap-around type pipe markers as specified in Part 2 – Products.

6
7 Identify valves with signs per NFPA rulings.

8
9 Provide hydraulic design information sign of permanently marked weatherproof metal or engraved
10 nameplate material. Secure to alarm valve with brass chain. Information to include location of the design
11 areas, discharge densities, required flow and residual pressure at the base of riser, hose stream demand and
12 sprinkler demand.

13
14 **SLEEVES AND OPENINGS**

15 Provide galvanized sheet metal sleeves for fire rated pipe penetrations through interior and exterior walls to
16 provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction
17 and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration
18 through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In existing
19 poured concrete walls where penetration is core drilled, pipe sleeve is not required. Grout holes directly
20 around steel pipe.

21
22 Pipe sleeves are not required in interior non-rated drywall, plaster, or wood partitions and sleeves are not
23 required in existing poured concrete walls where penetrations are core drilled.

24
25 Pipe sleeves in new poured concrete construction shall be Schedule 40 steel pipe (size to allow insulated
26 pipe to run thru sleeve), cast in place.

27
28 In all piping floor penetrations, fire rated and non-fire rated top of sleeve shall extend 1 inch above the
29 adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert
30 schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe
31 penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the
32 sleeve that will transfer the weight to existing floor structure.

33
34 **SEALING AND FIRE STOPPING**

35 **FIRE AND/OR SMOKE RATED PENETRATIONS:**

36 Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance
37 with section 07 84 00 Fire Stopping.

38
39 **NON-RATED PARTITIONS:**

40 At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to
41 both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored
42 opening and the pipe or insulation is completely blocked.

43
44
45 **END OF SECTION**

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SECTION 21 13 13
WET-PIPE SPRINKLER SYSTEM

PART 1 - GENERAL

SCOPE

This section contains specifications for fire suppression pipe and pipe fittings for this project. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Shop Drawings
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS

- Fire suppression Piping
- Unions and Flanges
- Mechanical Grooved Pipe Connections
- Sprinkler Heads
- Flexible Sprinkler Drop Fittings
- Valves

PART 3 – EXECUTION

- General
- Preparation
- Erection
- Welded Pipe Joints
- Threaded Pipe Joints
- Mechanical Grooved Pipe Connections
- Unions and Flanges
- Piping System Leak Tests
- Underground Water Main Flushing
- Installation
- Construction Verification Items

RELATED WORK

- Section 21 08 00 – Commissioning of Fire Suppression
- Section 21 05 00 – Common Work Results for Fire Suppression
- Section 21 05 29 – Hangers and Supports for Fire Suppression Piping and Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

- ANSI A21.4
- ANSI A21.11
- ANSI A21.51
- ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings
- ANSI B16.3 Malleable and Ductile Iron Threaded Fittings
- ANSI B16.4 Cast Iron Threaded Fittings

1	ANSI B16.5	Pipe Flanges and Flanged Fittings
2	ANSI B16.9	Factory Made Wrought Steel Buttweld Fittings
3	ANSI B16.11	Forged Steel Fittings, Socket Welded and Threaded
4	ANSI B16.18	Cast Bronze Solder Joint Pressure Fittings
5	ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
6	ASTM A105	Forgings, Carbon Steel, for Piping Components
7	ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
8	ASTM A135	Electric Resistance Welded Steel Pipe
9	ASTM A181	Forgings, Carbon Steel for General Purpose Piping
10	ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated
11		Temperatures
12	ASTM A536	Ductile Iron Castings
13	ASTM A795	Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for
14		Fire Protection Use
15	ASTM B88	Seamless Copper Water Tube
16	AWS A5.8	Brazing Filler Metal
17	AWS D10.9	Qualification of Welding Procedures and Welders for Piping and Tubing, Level AR3
18	NFPA 13	Installation of Sprinkler Systems. (Latest prevailing edition)
19	NFPA 14	Installation of Standpipe and Hose Systems. (Latest prevailing edition)
20	UL	Underwriters' Laboratories Listing
21	FM	Factory Mutual Approval

22

23 **SHOP DRAWINGS**

24 Schedule from the contractor indicating the ANSI/ASTM specification number of the pipe being proposed
 25 along with its type and grade, if known at the time of submittal, and sufficient information to indicate the
 26 type and rating of fittings for each service.

27

28 **QUALITY ASSURANCE**

29

30 Substitution of Materials: Refer to Section GC – General Conditions of the Contract, Equals and
 31 Substitutions.

32

33 Order all steel pipe with each length marked with the name or trademark of the manufacturer and type of
 34 pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper,
 35 size, and name of supplier.

36

37 Any installed material not meeting the specification requirements must be replaced with material that meets
 38 these specifications without additional cost to the Owner.

39

40 **DELIVERY, STORAGE, AND HANDLING**

41 Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

42

43 Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid
 44 condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not
 45 damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect
 46 fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

47

48 Offsite storage agreements will not relieve the contractor from using proper storage techniques.

49

50 Storage and protection methods must allow inspection to verify products.

51

52 **DESIGN CRITERIA**

1 Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM
2 specifications as listed in this specification.
3
4 Construct all piping systems for the highest pressures and temperatures in the respective system but not less
5 than 175 psig.
6
7 Where weld fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.
8
9 Where mechanical grooved fittings are used, use only ASTM standard radius fittings, short radius grooved
10 fittings are not allowed.
11
12 Where ASTM A53 or A795 type F pipe is specified, grade A type E or S, or grade B type E or S may be
13 substituted at Contractor's option. Where ASTM A135 grade A pipe is specified, grade B pipe may be
14 substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from
15 those commercially available.
16
17 Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn)
18 temper copper tubing may be substituted at Contractor's option.
19

20 **WELDER QUALIFICATIONS**

21 Welding procedures, welders, and welding operators for all building service piping to be in accordance
22 with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of
23 ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for
24 Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding
25 Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of
26 ASME B31.9 Building Services Piping.
27
28 The Architect or Engineer reserves the right to test the work of any welder employed on the project, at the
29 Owner's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented
30 from doing further welding on the project and all defective welds replaced.
31
32

33 **PART 2 - PRODUCTS**

34 **FIRE SUPPRESSION PIPING**

35 **STEEL PIPE:**

36 Black steel pipe welded and seamless, Type F, Grade A, ASTM A53; black welded and seamless steel pipe
37 for fire protection use, Type F, ASTM A795; electric resistance welded steel pipe, Grade A, ASTM A135.
38
39

40 Pipe wall Thickness: Schedule 40 for welded, rolled groove, cut groove and threaded. Schedule 30 for
41 welded, rolled groove, 8" and larger cut groove and 8" and larger threaded piping. Schedule 10 up to and
42 including 6" for rolled groove and welded.
43

44 Fittings: 2" and under – Cast iron threaded fittings, Class 125 or 250, ASTM A126/ANSI B16.4. Malleable
45 iron threaded fittings, Class 150 or 300, ASTM A197/ANSI B16.3. Standard weight seamless steel weld
46 fittings, ASTM A234 grade, ANSI B16.9. Mechanical grooved fittings with EPDM gaskets, ASTM A536
47 ductile iron, ATM A47 malleable iron or ASTM A53 fabricated steel.
48

49 Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding
50 materials.
51

52 Finish: Hot dipped zinc coated (galvanized) finish on piping and fittings shall be used in drypipe and pre-
53 action systems, piping exposed to weather and piping exposed to corrosive environments where indicated.

1 Thread or cut groove hot dipped zinc coated pipe ends for fitting connections. Indoor dry standpipe systems
2 supplied by a Fire Dept. connection only may be black steel piping and fittings.

3 4 **UNIONS AND FLANGES**

5 **2" AND SMALLER STEEL:**

6 ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel
7 piping and galvanized malleable iron on galvanized steel piping. Grooved couplings may be used in lieu of
8 unions.

9 10 **2-1/2" AND LARGER:**

11 ASTM A181 or A105, Class 150, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on
12 pattern on black steel and threaded only on galvanized steel. ANSI B16.1 or ANSI B16.5, Class 150 cast
13 iron threaded flanges. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or
14 equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for
15 mating with other flat face flanges on equipment.

16 17 **MECHANICAL GROOVED PIPE CONNECTIONS**

18 Mechanical grooved pipe couplings and fittings, ASTM F1476, as manufactured by Victaulic, Anvil, or
19 Grinnell may be used with steel pipe. Mechanical grooved components and assemblies to be rated for
20 minimum 175 psi working pressure unless noted otherwise.

21
22 All mechanical grooved pipe material including gaskets, couplings, fittings and flange adapters shall be
23 from the same manufacturer.

24
25 Couplings and fittings to be malleable iron, ASTM A47, or ductile iron A536 with painted finish. Fittings
26 used on galvanized steel pipe to have galvanized finish, ASTM A153.

27
28 Gaskets to be EPDM, ASTM D2000. Gaskets for dry systems to be flush seal design. Heat treated carbon
29 steel oval neck track bolts and nuts, ASTM A-183, with zinc electroplated finish.

30
31 Flange adapters to be ductile iron, ASTM A536; except at lug type butterfly valves where standard
32 threaded flanges shall be used.

33 34 **SPRINKLER HEADS**

35 Manufacturer: Sprinkler head model numbers establish type and style of head. Products of the following
36 manufacturers determined to be equal by the Architect/Engineer will be accepted: Tyco, Reliable, Victaulic
37 and Viking and Flexhead Industries.

38
39 Fusible link or glass bulb type, cast brass or bronze construction. Provide heads with nominal 1/2" or
40 17/32" discharge orifice except where greater than normal density requires large orifice.

41
42 Select fusible link or glass bulb temperature rating to not exceed maximum ambient temperature rating
43 allowed under normal conditions at installed location. Provide ordinary temperature (155 to 165 degree)
44 fusible link or glass bulb type except at skylights, sealed display windows, unventilated attics and roof
45 spaces, over cooking equipment, adjacent to diffusers, unit heaters, uninsulated heating pipes or ducts,
46 mechanical rooms, storage rooms, or where otherwise indicated.

47
48 Provide quantity of spare heads as noted below and 1 wrench for each type of head and each temperature
49 range installed. Provide 6 spare heads per 300 or less installed heads, 12 per 1000 or less and 24 for more
50 than 1000. Provide steel cabinet for storage of heads and wrenches. Provide an equal number of concealed
51 cover plates and/or sprinkler escutcheons for each spare sprinkler head.

52 53 **FLEXIBLE SPRINKLER HEAD:**

1 A flexible sprinkler head system may be used. The connection shall be a flexible fully braided stainless
2 steel hose assemble with a minimum 1" internal ID and a multiport bracket. The system shall be approved
3 for use in suspended ceiling systems, meeting ASTM C635, ASTM C636, and FM Global approved.
4 System shall be equal to Flexhead Industries.

5
6 Pendant: Star Model SG (QR), chrome plated finish and escutcheon.

7
8 Horizontal Sidewall: Star Model SG (QR), chrome plated finish and escutcheon.

9
10 Quick Response Pendant: Viking Microfast M, chrome plated finish and escutcheon.

11
12 Quick Response Sidewall: Viking Microfast M, chrome plated finish and escutcheon.

13
14 Dry Pendant (Self-contained type): Viking Model C, brass finish with brass escutcheon.

15
16 Dry Pendant (Self-contained type): Viking Model M (Quick Response), adjustable, recessed, with chrome
17 escutcheon.

18
19 Dry Horizontal Sidewall (Self-contained type): Viking Model M (Quick response), adjustable, recessed,
20 with chrome escutcheon.

21
22 **VALVES**

23 Manufacturers: Kennedy, Milwaukee, Nibco, Stockham, Victaulic, or Watts.

24
25 **BALL VALVES:**

26 2" and smaller: Bronze, 2-piece, threaded or sweat ends, standard port, blowout proof stem, chrome plated
27 ball, glass reinforced seats, UL approved @ 250 psi. Watts No. B-6000 UL.

28
29 **GATE VALVES:**

30 2" and smaller: Outside screw and yoke gate valves, 175 psig, bronze body, bronze mounted, screwed
31 bonnet, rising stem, solid wedge, with normally open tamper switch with double wire leads.

32
33 2-1/2" and larger: Outside screw and yoke gate valves, 175 psig, cast iron body, bronze mounted, bolted
34 bonnet, rising stem, solid wedge, with normally open tamper switch with double wire leads.

35
36 **BUTTERFLY VALVES:**

37 2" and smaller: Bronze body butterfly valve, 175 psig, geared operator, visible position indicator, normally
38 open tamper switch with double wire leads, Buna or Viton seat, stainless steel disc and stem.

39
40 2" and larger: Cast or ductile iron body butterfly valve, lug style or grooved, 175 psig, geared operator,
41 visible position indicator, normally open tamper switch with double wire leads, EPDM resilient seat,
42 EPDM seals, nickel plated ductile iron disc. Valve assembly to be bubble tight to 175 psig with no
43 downstream flange/pipe attached. Use cap screws for removal of downstream piping while using the valve
44 for system shutoff.

45
46 **CHECK VALVES:**

47 3" and smaller: Bronze body, threaded end, Y-pattern, regrindable bronze seat, renewable bronze disc, 175
48 psig, suitable for installation in a horizontal or vertical line with flow upward.

49
50 2-1/2" and larger: Cast or ductile iron body, flanged or grooved ends, bronze trim, bolted cap, renewable
51 bronze seat and disc, 175 psig, suitable for installation in a horizontal or vertical line with flow upward.

52
53 Provide 1/2" automatic drip drain on inlet of fire dept. connection check valve.

1
2 **DRAIN VALVES:**

3 3/4" minimum two piece bronze body ball valve; threaded ends, chrome plated bronze ball; glass filled
4 teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 400 psig WOG, with hose thread
5 outlet and cap.
6

7 **PART 3 - EXECUTION**
8

9 **GENERAL**

10 Install pipe fittings, and other fire suppression system components in accordance with reference standards,
11 manufacturers recommendations and recognized industry practices.
12

13 **PREPARATION**

14 Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior
15 of each section of pipe and fitting prior to assembly.
16

17 **ERECTION**

18 Prior to installation, complete working drawings must be approved by the owner or designated reviewing
19 agency, the Architect/Engineer, the State and the City of Madison Fire Department.
20

21 Provide all required offsets in fire protection piping that are necessary to accommodate mechanical,
22 structural and electrical systems. Review all drawings and building conditions and make all necessary
23 adjustments to piping layout as required. All sprinkler, drain and test piping, etc. installed through exterior
24 walls should be galvanized. All piping must be substantially supported from building structure and only
25 approved type hangers shall be used. Bulk mains and cross mains shall be supported from primary building
26 structure members. Piping under ducts shall not be supported from ductwork but shall be supported from
27 building structure with trapeze hangers where necessary or from steel angles supporting ductwork in
28 accordance with NFPA 13. In all cases, consult drawings for locations of pipe spaces, ceiling types, and
29 ceiling heights, ceiling grids, light fixtures, and grilles and diffusers before installing pipe.
30

31 Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of
32 elastomeric pipe insulation.
33

34 Provide 3/32" min. thickness steel nailing plates behind or on either side of piping where the possibility of
35 penetration from nails or drywall screws exists.
36

37 Maintain piping in clean condition internally during construction.
38

39 Provide clearance for access to valves and piping specialties.
40

41 Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and
42 contract without damage to itself, equipment, or building.
43

44 Install piping so that system can be drained. Where possible, slope to main drain valve. Where piping not
45 susceptible to freezing cannot be fully drained, install nipple and cap for drainage of less than 5 gallons or
46 ball valve with hose thread outlet and cap for drainage over 5 gallons. Pipe main drain valve to grade or to
47 air gap sewer receptor.
48

49 Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are
50 not acceptable.
51

52 Do not route piping within exterior walls.
53

1 Do not route piping through transformer vaults or above transformers, panelboards, or switchboards,
2 including the required service space for this equipment, unless the piping is serving this equipment.
3

4 Install all valves and piping specialties, including items furnished by others, as specified and/or detailed.
5 Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and
6 systems installed by others where same requires the piping services indicated in this section.
7

8 9 **WELDED PIPE JOINTS**

10 Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes
11 where applicable. "Weldolets" and "Threadolets" may be used up to one-half (1/2) the diameter of the main
12

13 **THREADED PIPE JOINTS**

14 Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking
15 will be allowed.
16

17 **MECHANICAL GROOVED PIPE CONNECTIONS**

18 Use pipe factory grooved in accordance with the coupling manufacturer's specifications or field grooved
19 pipe in accordance with the same specifications using specially designed tools available for the application.
20 Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling
21 manufacturer's specifications.
22

23 **UNIONS AND FLANGES**

24 Install a union, flange or grooved coupling combination at each connection to each piece of equipment and
25 at other items which may require removal for maintenance, repair, or replacement. Where a valve is located
26 at a piece of equipment, locate the flange or union or grooved coupling combination connections on the
27 equipment side of the valve. Concealed unions, flanges or couplings are not acceptable.
28

29 **PIPING SYSTEM LEAK TESTS**

30 Conduct pressure test with test medium of water. If leaks are found, repair the area with new materials and
31 repeat the test; caulking will not be acceptable.
32

33 Test piping in sections or entire system as required by sequence of construction. Do not conceal pipe until it
34 has been successfully tested. If required for the additional pressure load under test, provide temporary
35 restraints at fittings or expansion joints. Entire test must be witnessed by the Division's representative.
36

37 Use clean water and remove air from the piping being tested where possible. Measure and record test
38 pressure at the high point in the system.
39

40 Test system at 200 psi for 2 hours showing no leakage. Where system design is in excess of 150 psig,
41 test at a pressure 50 psig above system design pressure.
42

43 All pressure tests are to be documented on NFPA Contractor's Material and Test Certificate forms.
44

45 **LEAK DAMAGE**

46 The contractor shall be responsible during the installation and testing periods of the sprinkler system for
47 any damage to the work of others, to the building, its contents, etc. caused by leaks in any equipment, by
48 unplugged or disconnected pipes, fittings, etc., or by overflow and shall pay for the necessary equipment, or
49 landscaping damaged by such leakage.
50

51 **UNDERGROUND WATER MAIN FLUSHING**

1 Conduct flushing of the underground water/fire main service as required by NFPA 13. The 200 PSI
2 pressure test of the main shall be conducted by the installer of the main. The flushing operation is to be
3 documented on NFPA Underground Contractor's Material and Test Certificate forms.

4
5 **INSTALLATION**

6 Install fire protection system components in accordance with NFPA rulings, listings and manufacturers
7 recommendations. Locate where accessible for servicing and replacement.

8
9 Sprinkler Heads: Locate sprinkler heads as indicated on fire protection plan and reflected ceiling plan
10 maintaining minimum clearances from obstructions, ceilings and walls. Install sprinkler heads level in
11 locations not subject to spray pattern interference. Provide fire sprinkler head installations below ductwork,
12 soffits, etc.

13
14 Semi-recessed sprinkler heads shall be used for all suspended ceiling types with lay-in or gypsum board.

15
16 Locate sprinkler heads to coordinate with reflected ceiling plan maintaining minimum clearances from
17 obstructions, ceilings, and walls. Install sprinkler heads level in locations not subject to spray pattern
18 interference. When installed in new lay-in ceilings, sprinkler heads shall be centered in tile. A one-inch
19 tolerance for sprinkler head placement will be acceptable. When installed in decorative ceilings, the head
20 locations shall be coordinated with ceiling system and shall be approved by Architect.

21
22 Switches: Locate flow and pressure switches where indicated and where required to obtain specified
23 zoning to isolate floors and major areas of floors. Provide valved test connection for flow switch adjacent
24 to flow switch. Pipe to floor drain. Test flow switch to verify proper operation.

25
26 Gauges: Provide a valved pressure gauge in main fire protection riser, at the top of each piping riser, at
27 inlet and outlet of pump and elsewhere as indicated.

28
29 Valves: Properly align piping before installation of valves. Do not support weight of piping system on
30 valve ends. Mount valves in locations which allow access for operation, servicing and replacement. Install
31 all valves with the stem in the upright or horizontal position. Valves installed with the stems down will not
32 be accepted. Provide a riser shutoff valve and a capped hose thread drain valve at the bottom of each riser.
33 Provide capped hose thread drain valves to allow draining of each portion of piping.

34
35
36 **END OF SECTION**
37

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SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

SCOPE

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:

PART 1 - GENERAL

- Scope
- Reference
- Standards
- Quality Assurance
- Continuity of Existing Services
- Codes
- Certificates and Inspections
- Submittals
- Operating and Maintenance Data
- Training of Owner Personnel
- Record Drawings

PART 2 - PRODUCTS

- Identification
- Sealing and Fire Stopping
- Concrete Work

PART 3 - EXECUTION

- Demolition
- Cutting and Patching
- Building Access
- Equipment Access
- Coordination
- Identification
- Training

REFERENCE

Applicable provisions of Division 1 govern work under this section.

This section applies to all Division 22 00 00 sections of plumbing.

STANDARDS

Abbreviations of standards organizations referenced in this and other sections are as follows:

- ABMA American Boiler Manufacturers Association
- ANSI American National Standards Institute
- ASME American Society of Mechanical Engineers
- ASPE American society of Plumbing Engineers
- ASSE American Society of Sanitary Engineering
- ASTM American Society for Testing and Materials
- AWS American Welding Society
- CS Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
- EPA Environmental Protection Agency
- FS Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
- IAPMO International Association of Plumbing & Mechanical Officials
- MCA Mechanical Contractors Association

- 1 MICA Midwest Insulation Contractors Association
- 2 MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
- 3 NBS National Bureau of Standards
- 4 NEC National Electric Code
- 5 NEMA National Electrical Manufacturers Association
- 6 NFPA National Fire Protection Association
- 7 NSF National Sanitation Foundation
- 8 PDI Plumbing and Drainage Institute
- 9 UL Underwriters Laboratories Inc.

10

11 Standards referenced in this section:

- 12 ACI 614 Recommended Practice for Measuring, Mixing and Placing of Concrete
- 13 ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- 14 ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
- 15 D.O.T. Standard Specifications for Road and Bridge Construction, State of Wisconsin, Dept. of
16 Transportation
- 17 UL1479 Fire Tests of Through-Penetration Firestops
- 18 UL723 Surface Burning Characteristics of Building Materials

19

20 **QUALITY ASSURANCE**

21 Substitution of Materials: Refer to Division 1 - Basic Requirements

22

23 All products and materials used are to be new, undamaged, clean and in good condition. Existing products
24 and materials are not to be reused unless specifically indicated.

25

26 Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings,
27 or engineering parameters from those indicated on the contract documents, the contractor is responsible for
28 all costs involved in integrating the equipment or accessories into the system and for obtaining the intended
29 performance from the system into which these items are placed.

30

31 **CONTINUITY OF EXISTING SERVICES**

32 Do not interrupt or change existing services without prior written approval from the Owner's Project
33 Representative. When interruption is required, coordinate scheduling of down-time with the Owner to
34 minimize disruption to his activities.

35

36 **CODES**

37 Comply with requirements of Wisconsin Administrative Code.

38

39 **CERTIFICATES AND INSPECTIONS**

40 Refer also to Division 1.

41

42 Obtain and pay for all required City of Madison or State of Wisconsin installation inspections except those
43 provided by the Architect/Engineer in accordance with Wis. Admin. Code Section ILHR 50.12. Deliver
44 originals of these certificates to the Owner's Project Representative. Include copies of the certificates in the
45 Operating and Maintenance Instructions.

46

47 **SUBMITTALS**

48 Refer to Division 1.

49

50 Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to
51 submit the following plumbing system data sheet. List piping material type for each piping service on the
52 project, ASTM number, schedule or pressure class, joint type, manufacturer and model number where
53 appropriate. List valves and specialties for each piping service, fixture and equipment with manufacturer

1 and model number. The approved plumbing system data sheet(s) will be made available to the Owner's
2 Project Representative for their use on this project.

3
4 **PLUMBING SYSTEM DATA SHEET**

5 Item Pipe Service/Sizes Manufacturer/Model No. Remarks

6 Pipe

7 Fittings

8 Unions

9 Valves:

10 Ball

11 Plumbing Specialties:

12 Floor Drains & Cleanouts

13 Hangers & Supports

14 Insulation

15
16 Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material
17 index list page showing item designation, manufacturer and additional items supplied with the installation.
18 Submit for all equipment and systems as indicated in the respective specification sections, marking each
19 submittal with that specification section number. Mark general catalog sheets and drawings to indicate
20 specific items being submitted and proper identification of equipment by name and/or number, as indicated
21 in the construction documents. Include wiring diagrams of electrically powered equipment.

22
23 Submit sufficient quantities of equipment data sheets and shop drawings to allow the following
24 distribution:

- 25 • Insertion into Operating and Maintenance Manuals 2 copies
- 26 • Dane County Public Works - record copy 1 copy
- 27 • Engineers - record copies 2 copies

28
29 **OPERATION AND MAINTENANCE DATA**

30 All operations and maintenance data shall comply with the submission and content requirements specified
31 under Division 1 - Basic Requirements.

32
33 Two copies of Operations and Maintenance Manuals shall be provided for the following distribution:

- 34 • Dane County Public Works 1 copy
- 35 • Dane County Facilities Management 1 copy

36
37 In addition to the general content specified under - Basic Requirements supply the following additional
38 documentation:

- 39 1. Records of tests performed a to certify compliance with system requirements
- 40 2. Manufacturer's wiring diagrams for electrically powered equipment
- 41 3. Certificates of inspection by regulatory agencies
- 42 4. Valve schedules
- 43 5. Lubrication instructions, including list/frequency of lubrication
- 44 6. Parts lists for fixtures, equipment, valves and specialties.
- 45 7. Manufacturers installation, operation and maintenance recommendations for fixtures, equipment,
46 valves and specialties.
- 47 8. Additional information as indicated in the technical specification sections

48
49 **TRAINING OF OWNER PERSONNEL**

50 Instruct owner personnel in the proper operation and maintenance of systems and equipment provided as
51 part of this project. Include not less than 2 hours of instruction, using the Operating and Maintenance
52 manuals during this instruction. Demonstrate startup, operation and shutdown procedures for all
53 equipment. All training to be during normal working hours. Videotape all instructions and provide owner
54 with copy.

55
56 **RECORD DRAWINGS**

1 Refer to Division 1. - Basic Requirements, As Built and Record Drawings and Specifications.

2
3 **PART 2 - PRODUCTS**

4
5 **IDENTIFICATION**

6 **STENCILS:**

7 Not less than 1 inch high letters/numbers for marking pipe and equipment.

8
9 **ENGRAVED NAME PLATES:**

10 White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting,
11 Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W.
12 H. Brady.

13
14 **SNAP-AROUND PIPE MARKERS:**

15 One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable
16 labeling and flow direction arrows, 3/4" min. size for lettering. Provide nylon ties on each end of pipe
17 markers. Equal to Seton Setmark.

18
19 **VALVE TAGS:**

20 Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum
21 diameter, with brass jack chains, brass "S" hooks or one piece nylon ties around the valve stem, available
22 from EMED Co., Seton Name Plate Company, or W. H. Brady.

23
24 **SEALING AND FIRESTOPPING**

25
26 **FIRE AND/OR SMOKE RATED PENETRATIONS:**

27
28 Manufacturers: 3M, Hilti, Rectorseal, STI/SpecSeal, Tremco, or approved equal.

29
30 All firestopping systems shall be provided by the same manufacturer.

31
32 Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the
33 Department of Commerce.

34
35 Submittals: Contractor shall submit product data for each firestop system. Submittals shall include
36 product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and
37 procedures for each method of installation applicable to this project. For non-standard conditions where no
38 UL tested system exists, submit manufacturer's drawings for UL system with known performance for
39 which an engineering judgement can be based upon.

40
41 Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference
42 architectural drawings for identification of fire and/or smoke rated walls and floors.

43
44 Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks,
45 firestop mortar or a combination of these products to provide a UL listed system for each application
46 required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

47
48 **NON-RATED PENETRATIONS:**

49
50 In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking
51 synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe and the
52 cored opening or a water-stop type wall sleeve. The operating bolts of the mechanical type seal shall be
53 accessible from the interior of the building.

1 At pipe penetrations of non-rated interior partitions, floors and exterior walls, use urethane caulk in
2 annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where
3 sleeve is not required use urethane caulk in annular space between pipe insulation and wall material
4
5

6 **PART 3 - EXECUTION**

7 8 **DEMOLITION**

9 Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to
10 be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition
11 to minimize the amount of contamination of the occupied space. Where pipe is removed and not
12 reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with
13 the Owner to minimize disruption to the existing building occupants.
14

15 All pipe, fixtures, equipment, wiring and associated conduit, insulation and similar items demolished,
16 abandoned, or deactivated are to be removed from the site by the Contractor except as specifically noted
17 otherwise. Maintain the condition of material and/or equipment that is indicated to be reused equal to that
18 existing before work began.
19

20 **CUTTING AND PATCHING**

21 Provide required Cutting and Patching to complete the work. Refer to Division 1 – Basic Requirements.
22

23 **BUILDING ACCESS**

24 Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus.
25 When the building access was not previously arranged and must be provided by this contractor, restore any
26 opening to its original condition after the apparatus has been brought into the building.
27

28 When access to the work area is through occupied areas coordinate building access times with the Owner's
29 Project Representative.
30

31 **EQUIPMENT ACCESS**

32 Install all piping, conduit and accessories to permit access to equipment for maintenance and service.
33

34 **COORDINATION**

35 Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that
36 interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
37

38 Verify that all devices are compatible for the type of construction and surfaces on which they will be used.
39

40 **IDENTIFICATION**

41 Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one
42 coat of black enamel against a light background or white enamel against a dark background. Use a primer
43 where necessary for proper paint adhesion.
44

45 Where stenciling is not appropriate for equipment identification, engraved name plates may be used.
46

47 Identify all new interior piping. Place flow directional arrows at each pipe identification location. Use one
48 coat of black enamel against a light background or white enamel against a dark background.
49

50 Identify valves with brass tags bearing a system identification and a valve sequence number. Valve tags
51 are not required at a terminal device unless the valves are greater than ten feet from the device, located in
52 another room or not visible from device. Provide a typewritten valve schedule and pipe identification
53 schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols

1 used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance
2 manual. Schedule in mechanical room to be framed under clear plastic.

3

4 **TRAINING**

5 Contractor to provide factory authorized representative and/or field personnel knowledgeable with the
6 operations, maintenance and troubleshooting of the system and/or components defined within this section
7 for a minimum period of 2 hours. Session may be videotaped.

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END OF SECTION

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**SECTION 22 05 14
PLUMBING SPECIALTIES**

PART 1 - GENERAL

SCOPE

This section includes specifications for floor drains, roof drains, cleanouts, backflow preventers, water hammer arrestors and other miscellaneous plumbing specialties.

PART 1 - GENERAL

- Scope
- Related Documents
- Reference
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operation and Maintenance Data

PART 2 - PRODUCTS

- Floor Drains
- Cleanouts
- Water Hammer Arrestors

PART 3 - EXECUTION

- Installation

RELATED DOCUMENTS

- Section 22 05 23 – General-Duty Valves for Plumbing Piping
- Section 22 11 00 – Facility Water Distribution
- Section 22 13 06 – Sanitary Waste and Vent
- Section 22 30 00 – Plumbing Equipment

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

REFERENCE STANDARDS

- ANSI A112.21.1 - Floor Drains.
- ANSI A112.26.1/PDI WH-201 - Water Hammer Arrestors.
- ASSE 1001 - Pipe Applied Atmospheric Type Vacuum Breakers.
- ASSE 1010 - Water Hammer Arrestors.
- ASSE 1011 - Hose Connection Vacuum Breakers.
- ASSE 1012 - Backflow Preventers with Intermediate Atmospheric Vent.
- ASSE 1013 - Reduced Pressure Principle Backflow Preventers.
- ASSE 1017-86- Thermostatic Mixing Valves
- ASSE 1019 – Wall Hydrants, Frost Proof Automatic Draining, Anti-Backflow Type.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section Division 1 – Basic requirements.

Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

SHOP DRAWINGS

Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

PART 2 - PRODUCTS

FLOOR DRAINS

Manufacturer: Sioux Chief, Josam, Smith, Wade, Watts, Zurn.

1 FD-1: On-grade, adjustable floor drain with Sch 40 hub connection and cast nickel 6-1/2" round
2 ring/strainer, equal to Sioux Chief 832-3ANR. Include SureSea "Plus" trap seal/check valve on drain in
3 laundry room.

4
5 FD-2: On-grade, adjustable floor drain with Sch. 40 hub connection and 8-1/2" cast iron round strainer,
6 equal to Sioux Chief 860-64i.

7
8 FD-3: Adjustable above grade floor drain with Sch. 40 hub connection and flashing collar with 6-1/2" round
9 cast nickel ring/strainer, equal to Sioux Chief 833-3P-NR.

10
11 **CLEANOUTS**

12 Manufacturer: Sioux Chief, Josam, Smith, Wade, Watts, Zurn.

13
14 FCO-1: Adjustable, on-grade cleanout with Sch. 40 hub connection and cast nickel round ring/strainer,
15 equal to Sioux Chief 834-P-NR.

16
17 **INTERIOR FINISHED WALL AREAS:** Line type cleanout tee with tapered threaded ABS cleanout plug,
18 round polished stainless steel access cover secured with machine screw. Zurn Z-1446- (Note: Screw
19 shall not pass completely through the ABS plug, trim screw as necessary)

20
21 **INTERIOR EXPOSED VERTICAL STACKS:** Line type cleanout tee with tapered threaded ABS closure
22 plug. Zurn Z-1445.

23
24 **INTERIOR HORIZONTAL LINES:** Cast iron hub with tapped ferrule and tapered threaded ABS or PVC
25 closure plug, or no-hub coupling and blind plug.

26
27 **WATER HAMMER ARRESTORS**

28 Manufacturer: PPP Industries, Sioux Chief, Wade, Watts.

29
30 ANSI A112.26.1, ASSE 1010; sized in accordance with PDI WH-201, precharged piston type constructed
31 of hard drawn Type K copper, threaded brass adapter, brass piston with o-ring seals, FDA approved
32 silicone lubricant, suitable for operation in temperature range 35 to 150 degrees F, maximum 250 psig
33 working pressure, 1500 psig surge pressure. Watts series 15.

34
35 **HOSE BIBBS**

36 HB-1: Bronze or brass construction hose faucet/valve, cast iron handwheel, replaceable disc, hose thread
37 spout, equal to Chicago Faucet 835-RCF with Watts 8A vacuum breaker.

38
39 **PART 3 - EXECUTION**

40
41 **INSTALLATION**

42 Coordinate location and setting of plumbing specialties with adjacent construction. Install in accordance
43 with manufacturers recommendations.

44
45 Set floor drains and cleanouts level and plumb adjusted to finished floor elevation, roof elevation or
46 finished wall location. Locate where serviceable. Allow minimum of 18" clearance around cleanouts for
47 rodding. Lubricate threaded cleanout plugs with graphite and oil, teflon tape or waterproof grease. Install
48 trap primer connections where indicated. Provide deep seal traps on floor drains and hub drains installed in
49 mechanical rooms, penthouses or rooms with excessive positive or negative pressure.

50
51 Install water hammer arrestors where indicated and at quick closing valve installations.

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55 **END OF SECTION**
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SECTION 22 05 23
GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

SCOPE

This section includes valve specifications for all Plumbing systems except where indicated under Related Work. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Quality Assurance
- Submittals
- Operation and Maintenance Data
- Design Criteria

PART 2 - PRODUCTS

- Water System Valves
- Ball Valves

PART 3 - EXECUTION

- General
- Shut-off Valves
- Balancing Valves
- Drain Valves

RELATED WORK

Section 22 30 00 - Plumbing Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 1 - Basic Requirements.

SUBMITTALS

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.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under Division 1 - Basic Requirements.

DESIGN CRITERIA

ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Supply Systems.

Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e. domestic water, gas, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from the Owner.

Valves to be line size unless specifically noted otherwise.

PART 2 - PRODUCTS

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WATER SYSTEM VALVES

All water system valves to be rated at not less than 125 water working pressure at 240 degrees F unless noted otherwise.

BALL VALVES:

2-1/2" and smaller: Two or three piece bronze body; full-port sweat ends, stainless steel ball and stem; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in all piping with insulation. Equal to Apollo 77C-140-04 and 77C-240-04. Products by Nibco, Milwaukee, and Watts are considered equal.

PART 3 - EXECUTION

GENERAL

Properly align piping before installation of valves. Install and test valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

Mount valves in locations which allow access for operation, servicing and replacement.

Provide valve handle extensions for all valves installed in insulated piping.

Install all valves with the stem in the upright or horizontal position. If possible, install butterfly valves with the stem in the horizontal position. Valves installed with the stems down will not be accepted.

Prior to flushing of piping systems, place all valves in the full-open position.

SHUT-OFF VALVES

Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

END OF SECTION

1
2 Support apparatus and material under all conditions of operation, variations in installed and operating
3 weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.
4

5 Protect insulation at all hanger points; see Related Work above.
6

7 **SHOP DRAWINGS**

8 Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe
9 size and type of service.

10
11 All submittals are to comply with submission and content requirements specified Division 1 - Basic
12 Requirements.

13
14 **DESIGN CRITERIA**

15 Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice
16 SP-58 and SP-69 unless noted otherwise.
17

18
19 **PART 2 - PRODUCTS**
20

21 **MANUFACTURERS**

22 Anvil, B-Line, Pate, Piping Technology or approved equal.
23

24 **STRUCTURAL SUPPORTS**

25 Provide all supporting steel required for the installation of mechanical equipment and materials, including
26 angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may
27 not be specifically indicated on the drawings.
28

29 **PIPE HANGERS AND SUPPORTS**

30 **HANGERS FOR PIPE SIZES 1/2" THROUGH 2":**

31 Carbon steel, adjustable swivel ring. B-Line B3170NF, Anvil 69 or 70.

32 Carbon steel, adjustable clevis, standard. B-Line B3100, Anvil 260.
33

34 **HANGERS FOR PIPE SIZES 2" AND LARGER:**

35 Carbon steel, adjustable clevis, standard. B-Line B3100, Anvil 260.
36

37 **MULTIPLE OR TRAPEZE HANGERS:**

38 Steel channels with welded spacers and hanger rods.
39

40 **WALL SUPPORT:**

41 Carbon steel welded bracket with hanger. B-Line 3068 Series, Anvil 194 Series.
42

43 Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely anchored to wall structure,
44 with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-
45 2000 series clamps, Anvil type PS 200 H with PS 1200 clamps. When copper piping is being supported,
46 provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and
47 avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers
48 clamp and cushion assemblies, B-Line BVT series, and Anvil PS 1400 series.
49

50 **VERTICAL SUPPORT:**

51 Carbon steel riser clamp. B-Line B3373, Anvil 261 for above floor use.
52

53 **FLOOR SUPPORT:**

54 Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

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COPPER PIPE SUPPORTS:

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.

PIPE HANGER RODS

STEEL HANGER RODS:

Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.

Size rods for individual hangers and trapeze support as indicated in the following schedule.

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.)	Rod Diameter
<u>(650°F Maximum Temp.)</u>	<u>(inches)</u>
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

BEAM CLAMPS

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, Anvil 86/92.

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, Anvil 228.

CONCRETE INSERTS

POURED IN PLACE:

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, Anvil 281.

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, Anvil 282.

DRILLED FASTENERS:

Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

ANCHORS

Use welding steel shapes, plates, and bars to secure piping to the structure.

PART 3 - EXECUTION

INSTALLATION

Size, apply and install supports and anchors in compliance with manufacturers recommendations.

1 Install supports to provide for free expansion of the piping system. Support all piping from the structure
2 using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and
3 wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

4
5 Coordinate hanger and support installation to properly group piping of all trades.

6
7 Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural
8 shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used,
9 pipe supporting devices made specifically for use with the channels may be substituted for the specified
10 supporting devices provided that similar types are used and all data is submitted for prior approval.

11
12 Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping
13 insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe
14 insulation or directly on piping.

15
16 Perform welding in accordance with standards of the American Welding Society.

17
18 **HANGER AND SUPPORT SPACING**

19 Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

20
21 Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

22
23 Use hangers with 1-1/2 inch minimum vertical adjustment.

24
25 Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze
26 hangers.

27
28 Support riser piping independently of connected horizontal piping.

29
30 Adjust hangers to obtain the slope specified in the piping section of these specifications.

31
32 Space hangers for pipe as follows:

<u>Pipe Material</u>	<u>Pipe Size</u>	<u>Max. Horiz. Spacing</u>	<u>Max. Vert. Spacing</u>
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"
Steel	1/2" through 1-1/4"	7'-0"	15'-0"
Steel	1-1/2" through 6"	10'-0"	15'-0"
Plastic	Drain & Vent	5'-0"	15'-0"

40
41 **RISER CLAMPS**

42 Support vertical piping with clamps secured to the piping and resting on the building structure or secured to
43 the building structure below at each floor.

44
45 **CONCRETE INSERTS**

46 Select size based on the manufacturer's stated load capacity and weight of material that will be supported.
47 Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
48 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch size. Where
49 concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

50
51 **ANCHORS**

52 Install where indicated on the drawings and details. Where not specifically indicated, install anchors at
53 ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make
54 provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

End of Section

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SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

SCOPE

This section includes insulation specifications for plumbing piping and equipment. Included are the following topics:

PART 1 - GENERAL

- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Description
- Definitions
- Shop Drawings
- Operation and Maintenance Data

PART 2 - PRODUCTS

- Materials
- Insulation & Jackets
- Insulation Inserts and Pipe Shields
- Accessories

PART 3 - EXECUTION

- Installation
- Piping, Valve and Fitting Insulation
- Construction Verification Items

RELATED WORK

- Section 22 05 00 - Common Work Results for Plumbing
- Section 22 11 00 - Facility Water Distribution
- Section 22 30 00 - Plumbing Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
ASTM C165	Test Method for Compressive Properties of Thermal Insulations
ASTM C177	Heat Flux and Thermal Transmission Properties
ASTM C195	Mineral Fiber Thermal Insulation Cement
ASTM C302	Density of Preformed Pipe Insulation
ASTM C449	Mineral Fiber Hydraulic Setting Thermal Insulation Cement
ASTM C518	Heat Flux and Thermal Transmission Properties
ASTM C547	Mineral Fiber Preformed Pipe Insulation
ASTM C553	Mineral Fiber Blanket and Felt Insulation
ASTM C612	Mineral Fiber Block and Board Thermal Insulation
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM E84	Surface Burning Characteristics of Building Materials
MICA	National Commercial & Industrial Insulation Standards
NFPA 225	Surface Burning Characteristics of Building Materials
UL 723	Surface Burning Characteristics of Building Materials

1 **QUALITY ASSURANCE**

2 Substitution of Materials: Refer to Division 1 - Basic Requirements.

3

4 Label all insulating products delivered to the construction site with the manufacturer's name and description
5 of materials.

6

7 **DESCRIPTION**

8 Furnish and install all insulating materials and accessories as specified or as required for a complete
9 installation. The following types of insulation are specified in this section:

- 10 • Pipe Insulation

11

12 Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors
13 Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only
14 be accepted where specifically modified in these specifications, or where prior written approval has been
15 obtained from the Project Representative.

16

17 **DEFINITIONS**

18 Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other
19 areas, including walk-through tunnels, shall be considered as exposed.

20

21 **SHOP DRAWINGS**

22 Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening
23 methods, fitting materials along with material safety data sheets and intended use of each material. Include
24 manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and
25 manufacturer's installation instructions.

26

27 **OPERATION AND MAINTENANCE DATA**

28 All operations and maintenance data shall comply with the submission and content requirements specified
29 under Division 1 - Basic Requirements.

30

31

32 **PART 2 - PRODUCTS**

33

34 **MATERIALS**

35 Materials or accessories containing asbestos will not be accepted.

36

37 Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame
38 spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

39

40 Insulation which is not located in an air plenum may have a flame spread rating not over 25 and a
41 smoke developed rating no higher than 150.

42

43 **INSULATION AND JACKETS**

44 Manufacturers: Armstrong, Certainteed Manson, Childers, Dow, Extol, Halstead, H.B. Fuller, Imcoa,
45 Knauf, Owens-Corning, Pittsburgh Corning, Rubatex, Johns-Mansville, or approved equal.

46

47 Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation
48 shall be suitable to receive jackets, adhesives and coatings as indicated.

49

50 **RIGID FIBERGLASS INSULATION:**

51 Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees
52 F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

53

1 White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing
2 pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance
3 of 50 units.

4
5 **SEMI-RIGID FIBERGLASS INSULATION:**

6 Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F,
7 minimum compressive strength of 125 PSF at 10% deformation, rated for service to 450 degrees F.
8 Insulation fibers perpendicular to jacket and scored for wrapping cylindrical surfaces.

9
10 White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a maximum
11 permeance of .02 perms and minimum beach puncture resistance of 50 units.

12
13 **FIREPROOFING INSULATION:**

14 Mineral fiber with nominal density of 8 lbs. per cu. ft., flame spread index of 15, fuel contribution index of
15 0, and smoke developed index of 0, thermal conductivity of not more than 0.23 at 75 degrees F.

16
17 Jacket material shall be the same as jacket for adjacent insulation.

18
19 **METAL JACKETS:**

20 .016 inch thick aluminum or .010 inch thick stainless steel with safety edge.

21
22 **INSULATION INSERTS AND PIPE SHIELDS**

23 Manufacturers: B-Line, Pipe Shields, Value Engineered Products

24
25 Construct inserts with calcium silicate, minimum 140 psi compressive strength. Piping 12" and larger,
26 supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield.
27 Insert and shield to be minimum 180 degree coverage on bottom of supported piping and full 360 degree
28 coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide
29 additional load distribution steel plate.

30
31 Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials,
32 thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered pre-
33 manufactured product described above. On low temperature systems, extruded polystyrene may be
34 substituted for calcium silicate provided insert and shield length and gauge are increased to compensate for
35 lower insulation compressive strength.

36
37 Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of same thickness as adjacent
38 insulation may be substituted for calcium silicate inserts with one 1"x 6" block for piping through 2-1/2"
39 and three 1" x 6" blocks for piping through 4". Submit shield schedule to demonstrate equivalency to pre-
40 engineered/pre-manufactured product described above.

41
42 Wood blocks will not be accepted.

43
44 **ACCESSORIES**

45 All products shall be compatible with surfaces and materials on which they are applied, and be suitable for
46 use at operating temperatures of the systems to which they are applied.

47
48 Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for
49 applications specified.

50
51 Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be
52 .015 inch for aluminum and .010 inch for stainless steel.

53
54 Tack fasteners to be stainless steel ring grooved shank tacks.

- 1
- 2 Staples to be clinch style.
- 3
- 4 Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.
- 5
- 6 Finishing cement to be ASTM C449.
- 7
- 8 Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.
- 9
- 10 Bedding compounds to be non-shrinking and permanently flexible.
- 11
- 12 Vapor barrier coatings to be non-flammable, fire resistant, polymeric resin.
- 13
- 14 Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.
- 15
- 16

17 **PART 3 - EXECUTION**

18 **INSTALLATION**

- 19
- 20 Install insulation, jackets and accessories in accordance with manufacturers instructions and under ambient
- 21 temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and
- 22 dry.
- 23
- 24 Do not insulate systems or equipment which are specified to be pressure tested or inspected, until testing,
- 25 inspection and any necessary repairs have been successfully completed.
- 26
- 27 Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be
- 28 accepted. Cover and seal exposed fiberglass insulation when insulation is terminated, no raw fiberglass
- 29 insulation is allowed. Provide neat and coated terminations at all nameplates, uninsulated fittings, or at
- 30 other locations where insulation terminates. Install with longitudinal joints facing wall or ceiling.
- 31
- 32 Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.
- 33
- 34 Use full-length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or
- 35 pieces cut undersize and stretched to fit will not be accepted.
- 36
- 37 Insulation shall be continuous through sleeves and openings. Vapor barriers shall be maintained continuous
- 38 through all penetrations.
- 39
- 40 Provide a complete vapor barrier for insulation on the following systems:
- 41
 - Cold water
- 42

43 **PIPING, VALVE, AND FITTING INSULATION**

44 **GENERAL:**

- 45 Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2” lap on jacket
- 46 seams and 2” tape on butt joints, firmly cemented with lap adhesive. Additionally secure with staples along
- 47 seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.
- 48
- 49 Water supply piping insulation shall be continuous throughout the building and installed adjacent to and
- 50 within building walls to a point directly behind the fixture that is being supplied.
- 51
- 52 Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior
- 53 of insulation. Where a vapor barrier is not required, hangers and supports may be attached directly to piping
- 54 with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where

1 riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and
2 vapor barrier jacketing/coating around riser clamp.

3

4 **INSULATION INSERTS AND PIPE SHIELDS:**

5 Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on
6 3/4" and smaller copper piping provided 12" long 22 gauge pipe shields are used.

7

8 **FITTINGS AND VALVES:**

9 Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up
10 insulation of the same thickness as adjoining insulation. Cover insulation with fabric reinforcing and mastic
11 or where temperatures do not exceed 150 degrees, PVC fitting covers. Secure PVC fitting covers with tack
12 fasteners and 1-1/2" band of mastic over ends, throat, seams or penetrations. On systems requiring vapor
13 barrier, use vapor barrier mastic.

14

15 **PIPE INSULATION SCHEDULE:**

16 Provide insulation on new and existing remodeled piping as indicated in the following schedule:

17

18

19 Service	20 Insulation	21 Insulation Thickness by Pipe Size				
		22 1" and	23 1-1/4"	24 2-1/2"	25 5" to 6"	26 8" and
		27 smaller	to 2"	to 4"		larger
Hot Water Supply	Rigid Fiberglass	1.5"	1.5"	1.5"	1.5"	1.5"
Cold Water	Rigid Fiberglass	0.5"	0.5"	1"	1"	1"

25

26

27

END OF SECTION

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1	ASTM B32	Solder Metal
2	ASTM B88	Seamless Copper Water Tube
3	ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
4	ASTM B813	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
5	AWS A5.8	Brazing Filler Metal
6	AWWA C104	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
7	AWWA C105	Polyethylene Encasement for Ductile Iron Piping for Water
8	AWWA C110	Ductile Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
9	AWWA C111	Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
10	AWWA C151	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or
11		Other Liquids
12	AWWA C153	Ductile Iron Compact Fittings, 3 In. Through 48 In., for Water and Other Liquids
13	AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances
14	AWWA C651	Disinfecting Water Mains

15
16 **SHOP DRAWINGS**

17 Schedule from the contractor indicating the ASTM, AWWA or CISPI specification number of the pipe
18 being proposed along with its type and grade if known at the time of submittal, and sufficient information
19 to indicate the type and rating of fittings for each service.

20
21 Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI
22 specification contained in this section.

23
24 **QUALITY ASSURANCE**

25 Substitution of Materials: Refer to Division 1 - Basic Requirements.

26
27 Order all copper, cast iron and steel with each length marked with the name or trademark of the
28 manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or
29 alloy designation, temper, size, and name of supplier.

30
31 Any installed material not meeting the specification requirements must be replaced with material that meets
32 these specifications without additional cost to the Owner.

33
34 **DELIVERY, STORAGE, AND HANDLING**

35 Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

36
37 Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid
38 condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not
39 damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect
40 fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

41
42 Storage and protection methods must allow inspection to verify products.

43
44 **DESIGN CRITERIA**

45 Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or
46 CISPI specifications as listed in this specification.

47
48 Construct all piping for the highest pressures and temperatures in the respective system.

49
50 Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in
51 ventilation plenum spaces, including plenum ceilings.

52
53 Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a
54 centerline radius of 1.5 pipe diameters.

1
2 Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted
3 at Contractor's option. Where the grade or type is not specified, Contractor may choose from those
4 commercially available.

5
6 Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn)
7 temper copper tubing may be substituted at Contractor's option.
8
9

10 **PART 2 - PRODUCTS**

11 **DOMESTIC WATER**

12 **ABOVE GROUND:**

13 Type L copper water tube, H (drawn) temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22;
14 lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8
15 BCuP. Copper mechanical grooved fittings and couplings on roll grooved pipe may be used in lieu of
16 soldered fittings.
17

18
19 Polyethylene tubing ASTM D2239, ASTM D2737, ASTM D2104, ASTM D2447.
20

21 Galvanized steel, Schedule 40, Grade A, ASTM A53; with cast iron threaded fittings, Class 125, ANSI
22 B16.4; forged steel threaded fittings, ANSI 16.11; mechanical cut groove couplings and fittings; galvanize
23 coat all fittings, ASTM A123.
24

25 Fittings 4" and larger may be cast iron, flanged, galvanized, 125 psi, ANSI standard B16.1 with neoprene
26 gasket.
27

28 **DIELECTRIC UNIONS AND FLANGES**

29 Watts Regulator Company, Lochinvar, Wilkins or EPCO Sales, Inc., dielectric unions 2" and smaller;
30 dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe
31 thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180
32 degrees.
33

34 **UNIONS AND FLANGES**

35 Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees.
36 Gasket material for flanges and flanged fittings shall be teflon type. Treated paper gaskets are not
37 acceptable.
38

39 **2" AND SMALLER STEEL:**

40 ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel
41 piping and galvanized malleable iron on galvanized steel piping.
42

43 **2" AND SMALLER COPPER:**

44 ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.
45

46 **PART 3 - EXECUTION**

47 **GENERAL**

48 Install pipe and fittings in accordance with reference standards, manufacturers recommendations and
49 recognized industry practices.
50

51 **PREPARATION**

52 Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior
53 of each section of pipe and fitting prior to assembly.
54

1
2 Piping shall be pitched to drain entire system; install drain vales at low points. Provide unions at piping
3 connections to all equipment, control valves etc. Provide offsets and transition fittings are required.

4
5 No water piping shall be installed in exterior walls above grade unless specifically approved by A/E and
6 unless adequately protected from freezing. Two inch insulation shall be installed on back and sides of
7 chase, front shall be open to rom heat, covered only by finished wall material.

8
9 Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of
10 elastomeric pipe insulation.

11
12 Use dielectric unions for connecting copper and steel piping.

13 14 **ERECTION**

15 Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a
16 window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute
17 piping as required to clear such interferences. Coordinate locations of plumbing piping with piping,
18 ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult
19 drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other
20 architectural details before installing piping.

21
22 Maintain piping in clean condition internally during construction.

23
24 Provide clearance for installation of insulation, access to valves and piping specialties.

25
26 Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and
27 contract without damage to itself, equipment, or building.

28
29 Do not route piping through transformer vaults or above transformers, elevator equipment rooms,
30 panelboards, or switchboards, including the required service space for this equipment, unless the piping is
31 serving this equipment

32
33 Install all valves and piping specialties, including items furnished by others, as specified and/or detailed.
34 Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and
35 systems installed by others where same requires the piping services indicated in this section.

36
37 Use dielectric unions for connecting copper and steel piping.

38
39 Extend hot water piping from water heaters and connect to all fixtures and equipment as required.

40
41 Hot water, hot water return and cold water lines shall be kept at least six (6) inches apart whenever
42 possible.

43 44 **COPPER PIPE JOINTS**

45 Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces.
46 Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning
47 operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when
48 placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder
49 appears. Wipe excess solder and flux from joint.

50 51 **WATER HAMMER ARRESTORS**

52 Water supply piping serving fixtures, appliance, and equipment with quick closing devices shall be
53 provided with water hammer suppressors.

1 Shock absorbing devices shall be mechanical suppressors as required and approved by the Plumbing code.
2 Mechanical suppressors shall be installed in accordance with hydraulic design of system and PDI Std.
3 WH201.

4
5 **STERILIZATION OF WATER DISTRIBUTION SYSTEM**

6 Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet
7 proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears
8 clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine
9 and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine
10 may be used and allowed to stand for 3 hours. Flush system with potable water until chlorine concentration
11 is no higher than source water level.

12
13 Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of
14 samples shall be representative of the system size and configuration and are subject to approval by
15 Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing
16 procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along
17 with test results.

18
19 **DIELECTRIC UNIONS AND FLANGES**

20 Install dielectric unions or flanges at each point where a copper-to-steel pipe connection is required in
21 domestic water systems.

22
23 **UNIONS AND FLANGES**

24 Install a union or flange at each connection to each piece of equipment and at other items which may
25 require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment,
26 locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are
27 not acceptable.

28
29 **PIPING SYSTEM LEAK TESTS**

30 Isolate or remove components from system which are not rated for test pressure. Test piping in sections or
31 entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been
32 successfully tested.

33
34 If required for the additional pressure load under test, provide temporary restraints at fittings or expansion
35 joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves
36 which may be exposed to isolate potential leaks.

37
38 For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents
39 or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

40
41 Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking
42 will not be acceptable.

43
44 Entire test must be witnessed by the Owners Project Representative. All pressure tests are to be
45 documented on forms to be provided to the contractor.

46
47

	Test	<u>Initial Test</u>	<u>Final Test</u>		
<u>System</u>	<u>Medium</u>	<u>Pressure</u>	<u>Duration</u>	<u>Pressure</u>	<u>Duration</u>
48 Above Ground Domestic Water	Water	N/A		100 psig	8 hr

49
50

51 **END OF SECTION**

1 **PIPING SYSTEM TEST REPORT**

2
3 **Date Submitted:** _____

4
5 **Project Name:** _____

6
7 **Location:** _____ **Project No:** _____

8
9 **Contractor:** _____

10
11 Plumbing Fire Sprinkler

12 Test Medium: Air Water Other _____

13
14 Test performed per specification section No. _____

15
16 Specified Test Duration _____ Hours Specified Test Pressure _____ PSIG

17
18 System Identification: _____

19 Describe Location: _____

20 _____

21	
22 Test Date: _____	
23 Start Test Time: _____	Initial Pressure: _____ PSIG
24	
25 Stop Test Time: _____	Final Pressure: _____ PSIG
26	

27 Tested By: _____ Witnessed By: _____

28 Title: _____ Title: _____

29 Signed: _____ Signed: _____

30 Date: _____ Date: _____

31 Comments: _____

32 _____

33 _____

34 _____

35 _____

36 _____

37 _____

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SECTION 22 13 00
SANITARY WASTE AND VENT PIPING

PART 1 – GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings for this project.

RELATED WORK

22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

22 05 15 – Piping Specialties

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI A21.4

ANSI A21.11

ANSI A21.51

ANSI B16.3

Malleable Iron Threaded Fittings

ANSI B16.4

Cast Iron Threaded Fittings

ANSI B16.5

Pipe Flanges and Flanged Fittings

ANSI B16.22

Wrought Copper and Wrought Alloy Solder Joint Pressure Fittings

ANSI B16.29

Wrought Copper and Wrought Alloy Solder Joint Drainage Fittings – DWV

ASTM A53

Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

ASTM A74

Cast Iron Soil Pipe and Fittings

ASTM A105

Forgings, Carbon Steel, for Piping Components

ASTM A126

Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A234

Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

ASTM A888

Hubless Cast Iron Soil Piping and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

ASTM B32

Solder Metal

ASTM B306

Copper Drainage Tube (DWV)

ASTM B813

Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

ASTM C564

Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings

ASTM C1540

Standard Specifications for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings

ASTM D1785

Poly Vinyl Chloride (PVC) Plastic Pipe (SDR Series)

ASTM D2466

Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D2564

Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

ASTM D2665

Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

ASTM D2729

Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D2855

Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

ASTM D3034

Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D3139

Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

ASTM D3212

Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals

ASTM D3222

Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials

ASTM D3311

Drain, Waste and Vent (DWV) Plastic Fitting Patterns

AWS A5.8

Brazing Filler Material

CISPI 301

Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications

1 CISPI 310 Couplings For Use in Connection With Hubless Cast Iron Soil Pipe and Fittings
2 for Sanitary and Storm Drain, Waste and Vent Piping Applications.
3

4 **SHOP DRAWINGS**

5 Schedule from the contractor indicating the ASTM or CISPI specification number of the pipe being
6 proposed along with its type and grade if known at the time of submittal, and sufficient information to
7 indicate the type and rating of fittings for each service.
8

9 Statement from manufacturer on his letterhead that pipe furnished meets the ASTM or CISPI specification
10 contained in this section.
11

12 **QUALITY ASSURANCE**

13 Substitution of Materials: Refer to Division 1 – Basic Requirements.
14

15 Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or
16 trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order
17 number, metal or alloy designation, temper, size, and name of supplier.
18

19 Any installed material not meeting the specification requirements must be replaced with material that meets
20 these specifications without additional cost to the State.
21

22 **DELIVERY, STORAGE AND HANDLING**

23 Promptly inspect shipments to insure that the material is undamaged and complies with specifications.
24

25 Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid
26 condensation. Do not store materials directly on grade. Protect pipe, tube and fitting ends so they are not
27 damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect
28 fittings, flanges, unions by storage inside or by durable, waterproof, above ground packaging.
29

30 Offsite storage agreements will not relieve the contractor from using proper storage techniques.
31

32 Storage and protection methods must allow inspection to verify products.
33

34 **DESIGN CRITERIA**

35 Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, or CISPI
36 specifications as listed in this specification.
37

38 Construct all piping for the highest pressures and temperatures in the respective system.
39

40 Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in
41 ventilation plenum spaces, including plenum ceilings.
42

43 Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a
44 centerline radius of 1.5 pipe diameters.
45

46 Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted
47 at Contractor's option. Where the grade or type is not specified, Contractor may choose from those
48 commercially available.
49

50 Where ASTM B88 type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn)
51 temper copper tubing may be substituted at Contractor's option.
52

53
54 **PART 2 – PRODUCTS**
55

56 **SANITARY WASTE AND VENT**

1 INTERIOR ABOVE GROUND
2 Hubless cast iron soil pipe and fittings, ASTM A888; with no hub couplings, CISPI 310, ASTM A74. Pipe
3 and fittings shall be marked with the collective trademark of the Cast Iron Pipe Institute or receive prior
4 approval of the Engineer.

5
6 Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DMV),
7 ANSI B16.23; wrought copper drainage fittings (DMV), ANSI B16.29; lead free(<.2%) solder, ASTM
8 B32; flux, ASTM B813; copper phosphorus brazing alloy, AWS A5.8 BCuP. Mechanically formed brazed
9 tee connections may be used in lieu of specified tee fittings for vent branch takeoffs up to one-half (1/2) the
10 diameter of the main.

11
12 PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and
13 vent pipe fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent
14 cement, ASTM D2564.

15
16 Galvanized steel pipe, Schedule 40, Type F, Grade A, ASTM A53; with cast iron threaded drainage
17 fittings, ASTM B16.12.

18 19 INTERIOR BELOW

20 Cast iron soil piping and fittings, hub and spigot, service weight, ASTM A74, with neoprene rubber
21 compression gaskets, ASTM C564, CISPI 301 and CISPI HSN 85. Pipe and fittings shall be marked with
22 the collective trademark of the Cast Iron Pipe Institute.

23
24 PVC Plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and
25 vent pipe and fittings, ASTM D2665; socket fittings patterns, ASTM D3311; primer, ASTM F656; solvent
26 cement, ASTM D2564.

27 28 PART 3 – EXECUTION

29 30 GENERAL

31 Install pipe and fittings in accordance with reference standards, manufacturer's recommendations, and
32 recognized industry practices.

33 34 PREPARTION

35 Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from the interior and
36 exterior of each section of pipe and fitting prior to assembly.

37 38 ERECTION

39 Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a
40 window, doorway, stairway or passageway. Where interferences develop in the field, offset or reroute
41 piping as required to clear such interferences. Coordinate locations of plumbing piping with piping,
42 ductwork, conduit, and equipment of other trades and existing piping to allow sufficient clearances. In all
43 cases, consult drawings for exact location of pipe spaces, ceilings heights, door and window openings, or
44 other details before installing piping.

45
46 Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of
47 elastomeric pipe insulation.

48
49 Maintain in clean condition internally during construction.

50
51 Provide clearance for installation of insulation, access to valves and piping specialties.

52
53 Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and
54 contract without damage to itself, equipment, or building.

55

1 Do not route piping through transformer vaults or above transformers, elevator equipment rooms,
2 panelboards, or switchboards, including the required service space for this equipment, unless the piping is
3 serving this equipment.

4
5 Install all valves and piping specialties, including items furnished by others, as specified and/or detailed.
6 Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures, and
7 systems installed by others where same requires piping services indicated in this section.

8
9 **COPPER PIPE JOINTS**

10 Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces.
11 Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning
12 operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when
13 placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder
14 appears. Wipe excess solder and flux from joint.

15
16 **THREADED PIPE JOINTS**

17 Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking
18 will be allowed.

19
20 **SOLVENT WELDED PIPE JOINTS**

21 Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings".
22 Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for
23 use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during
24 cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove any, dust,
25 debris, moisture, grease and other superfluous materials from the pipe interior and exterior. Check dry fit
26 of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy
27 body solvent cement for large diameter fittings.

28
29 Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing.
30 Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle
31 brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a
32 scrubbing motion. Check for penetration and reapply as needed to dissolve the surface to a depth of 4-5
33 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill
34 any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the
35 socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2
36 installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference
37 manufacturer's recommendations for ignition set time before handling and for full curing time before
38 pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when
39 specifically approved by the Owner's Project Representative.

40
41 **MECHANICAL HUBLESS PIPE CONNECTIONS**

42 Place the gasket on the end of one pipe or pipe fitting and clamp the assembly on the other end of the pipe
43 of fitting. Firmly seat the pipe or pipe fitting ends against the integrally molded shoulder inside the
44 neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to
45 manufacturer's recommended torque.

46
47 **SANITARY WASTE AND VENT**

48 Verify invert elevations and building elevations prior to installation. Install interior piping pitched to drain
49 at minimum slope of 1/4" per foot where possible and in no case less than 1/8" per foot for piping 3" and
50 larger.

51
52 Flush piping inlets (floor drains, mop basins, fixtures, etc.) with high flow of water at completion of project
53 to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to
54 be impaired.

55
56 **PIPING SYSTEM LEAK TESTS**

- 1 Isolate or remove components from system which are not rated for test pressure. Perform final testing for
 2 medical and lab gas with all system components in place. Test piping in sections or entire system as
 3 required by sequence of construction. Do not insulate or conceal piping until it has been successfully
 4 tested.
 5
 6 If required for the additional pressure load under test, provide temporary restraints at fittings or expansion
 7 joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves
 8 which may be exposed to isolate potential leaks.
 9
 10 For hydrostatic tests, use clean water and remove all air from the piping being tests by means of air vents or
 11 loosening of flange/unions. Measure and record test-pressure at the high point in the system.
 12
 13 For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then
 14 increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure
 15 is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System
 16 will not be approved until it can be demonstrated that there is no measureable loss of test pressure during
 17 the test period.
 18
 19 Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test;
 20 caulking will not be acceptable.
 21 Entire test shall be witnessed by the owners representative. All pressure tests are to be documented on
 22 forms to be provided to the contractor
 23

24	System		Test Medium	Initial Test Pressure	Duration	Final Test Pressure
25	Sanitary Waste and Vent	Water	N/A	2 hr.		10' Water

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 28 END OF SECTION
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SECTION 22 42 00
COMMERCIAL PLUMBING FIXTURES

PART 1 – GENERAL

SCOPE

This section includes specifications for plumbing fixtures, faucets and trim.

RELATED WORK

Section 22 11 00 – Facility Water Distribution

Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

Section 22 05 14 – Plumbing Specialties

Section 22 05 15 – Piping Specialties

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 1 – Basic Requirements.

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 submittal.

SUBMITTALS

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.

DESIGN CRITERIA

ANSI A112.6.1M-88 – Supports for Off-the Floor Plumbing Fixtures for Public Use.

ANSI A112.19.2M-82 – Vitreous China Plumbing Fixtures.

ANSI A112.19.5-79(R1990) – Trim for Water Closet Bowls, Tanks and Urinals

ANSI A112.18.1-94-Finished Rough Brass Plumbing Fixture Fittings

PART 2 – PRODUCTS

PLUMBING FIXTURES

Manufacturers: Fixture descriptions establish fixture type, quality, materials, features and size. Products of the following manufacturers determined as equal by the Architect/Engineer will be accepted.

- Lavatories – American Standard, Kohler, Zurn, Sloan
- Sinks – Elkay, Just, Bradley, Sloan
- Faucets – Chicago Faucet, Kohler, Speakman, Symmons, Sloan, Zurn.
- Stops and Supplies – Chicago Faucet Co., T&S Brass, McGuire.
(Heavy Duty Type Only)
- Traps – Kohler, McGuire, Dearborn, Engineered Brass Co. (17 Gauge Min.)
- Carrier and Supports – Josam, Smith, Wade, Watts Drainage, Zurn.

Lavatory L-1:

Wall hung, white vitreous china drilled for concealed arm carrier with 4" on center faucet openings.

Fixture: Kohler "Kingston" K-2005

Carrier: Floor mounted concealed arm

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Facuet: Kohler “Coralais” K-15199-F-CP.

Drain: Kohler L-13885 open grid perforated strainer, and 1-1/4” offset tailpiece.

Trap: 1-1/4” x 1-1/2” 176A cast brass.

Supplies & Stops: McGuire BV07 with loose key handles.

Sink S-1: Existing double compartment stainless steel sink to be re-installed including existing faucets, p-traps, and strainers.

Provide new food waste disposer equal to In Sink Erator Model “Badger” 5.

PART 3 – EXECUTION

INSTALLATION

Verify the existing water closet rough-in dimensions before ordering new units.

Install all 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 exposed piping.

Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing.

Install barrier free fixtures in compliance with IBC 1108 and 3408, COMM 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.

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.

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.

Seal openings between walls, floors and fixtures with mildew-resistant silicone sealant same color as fixture.

Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust valves for intended water flow rate to fixtures without splashing, noise or overflow. Lavatory metering faucets will be run for 2 minutes upon continuous detection. Adjust shower metering valves to run for 90 seconds.

Protect fixtures during construction. At completion clean plumbing fixtures and trim using manufacturer’s recommended cleaning methods and materials.

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SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

SCOPE

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.

RELATED WORK

23 05 93	Testing, Adjusting and Balancing for HVAC
23 07 00	HVAC Insulation
23 11 00	Facility Fuel Piping
23 23 00	Refrigerant Piping
23 31 00	HVAC Ducts
23 33 00	Air Duct Accessories
23 37 13	Diffusers, Registers and Grilles
23 54 00	Gas Fired Furnaces
23 62 13	Packaged Air Cooled Refrigerant Compressor and Condensing units
23 81 26	Split System Ductless Air Conditioners

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

Abbreviations of standards organizations referenced in other sections are as follows:

AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AGA	American Gas Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
EPA	Environmental Protection Agency
GAMA	Gas Appliance Manufacturers Association
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
UL	Underwriters Laboratories Inc.
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
UL723	Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Equals and Substitutions.

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 **PROTECTION OF FINISHED SURFACES**

2 Refer to Division 1, General Requirements, Protection of Finished Surfaces.

3
4 **SLEEVES AND OPENINGS**

5 Refer to Division 1, General Requirements, Sleeves and Openings.

6
7
8 **SUBMITTALS**

9 Refer to Division 1, General Conditions, Submittals.

10
11 Submit for all equipment and systems as indicated in the respective specification sections, marking each
12 submittal with that specification section number. Mark general catalog sheets and drawings to indicate
13 specific items being submitted and proper identification of equipment by name and/or number, as indicated
14 in the contract documents.

15
16 Before submitting electrically powered equipment, verify that the electrical power and control requirements
17 for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a
18 statement on the shop drawing transmittal to the architect/engineer that the equipment submitted and the
19 motor starter schedules are in agreement or indicate any discrepancies.

20
21 Include wiring diagrams of electrically powered equipment.

22
23 Submit sufficient quantities of shop drawings to allow the following distribution:

- 24
- 25 • Operating and Maintenance Manuals 2 copies
 - 26 • Testing, Adjusting and Balancing Contractor 1 copy
 - 27 • Division of Facilities Development 1 copy
 - 28 • A/E 1 copy

- 29
- 30 • Electronic copies may be submitted in lieu of paper copies. Entire submittal may not be
31 returned, only a Submittal Review Form with status of the submittal and any comments and
32 potentially selected sheets of the submittal with comments noted.

33 **CERTIFICATES AND INSPECTIONS**

34 Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.

35
36 Obtain and pay for all required State installation inspections except those provided by the Architect/Engineer
37 in accordance with code. Deliver originals of these certificates to the Division Project Representative.
38 Include copies of the certificates in the Operating and Maintenance Instructions.

39
40 **OPERATION AND MAINTENANCE DATA**

41 All operations and maintenance data shall comply with the submission and content requirements specified
42 under section GENERAL REQUIREMENTS.

43
44
45 **TRAINING OF OWNER PERSONNEL**

46 Instruct Owner personnel in the proper operation and maintenance of systems and equipment provided as
47 part of this project. Include not less than 2 hours of instruction, using the Operating and Maintenance manuals
48 during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be
49 during normal working hours.

50
51 **RECORD DRAWINGS**

52 Refer to Division 1, General Requirements, Record Drawings.

53
54 In addition to the data indicated in the General Requirements, maintain temperature control record drawings
55 on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with
56 the Operating and Maintenance manuals.

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PART 2 - PRODUCTS

ACCESS PANELS AND DOORS

LAY-IN CEILINGS:

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.

IDENTIFICATION

STENCILS:

Not less than 1 inch high letters/numbers for marking pipe and equipment.

PART 3 - EXECUTION

DEMOLITION

Perform all demolition as indicated on the drawings to accomplish new work. Where pipe or duct is removed and not reconnected with new work, cap ends of existing services as if they were new work

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 Owner.

Where items are to remain in place protect that material or equipment. Where material or equipment is to be removed and reinstalled that material or equipment shall be stored and protected to maintain the equipment is the same condition as was before removal. If it is damaged in storage the contractor shall replace the item at no cost to the Owner.

CUTTING AND PATCHING

Refer to Division 1, General Requirements, Cutting and Patching.

BUILDING ACCESS

Arrange for the necessary openings in the building to allow for admittance of all apparatus.

EQUIPMENT ACCESS

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.

COORDINATION

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, installed in/on architectural surfaces.

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.

Cooperate with the test and balance agency in ensuring Section 23 05 93 specification compliance. Verify system completion to the test and balance agency (clean filters, duct systems cleaned, controls adjusted and calibrated, controls cycled through their sequences, etc.), ready for testing, adjusting and balancing work. Install dampers, 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.

IDENTIFICATION

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.

Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

1 **LUBRICATION**
2 Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated
3 for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's
4 instructions until the work is accepted by DFD. Maintain a log of all lubricants used and frequency of
5 lubrication; include this information in the Operating and Maintenance Manuals at the completion of the
6 project.

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SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

SCOPE

This section includes air and water testing, adjusting and balancing for the entire project.

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC

Section 23 07 00 - HVAC Insulation

Section 23 37 13 - Diffusers, Registers and Grilles

Section 23 54 00 - Gas fired Furnaces

REFERENCE

Applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this section.

REFERENCE STANDARDS

AABC National Standards for Total System Balance, Sixth Edition, 2002.

ASHRAE ASHRAE Handbook, 2007 HVAC Applications, Chapter 37, Testing Adjusting and Balancing.

NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Seventh Edition, 2005.

TABB Tab Procedural Guide, First Edition, 2003.

DESCRIPTION

The Contractor will separately contract with an independent test and balance agency to perform all testing, adjusting, and balancing of air 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.

Provide total mechanical systems testing, adjusting and balancing. Requirements include the balance of air distribution, adjustment of new and existing systems and equipment to provide design requirements indicated on the drawings and verification of performance of all mechanical equipment, all in accordance with standards published by AABC, NEBB, or TABB.

Test, adjust and balance all air systems so that each room, piece of equipment or terminal device meets the design requirements indicated on the drawings and in the specifications.

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.

QUALITY ASSURANCE

Qualifications

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 than 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.

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 DFD immediately.

SUBMITTALS

See also Related Work in this section.

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.

1 Submission:

2
3 Distribute electronic copies of the Report to the Contractor, the A/E, Enter a RFI, requesting review of the
4 report.

5
6 Contents: Provide the following minimum information, forms and data:

7
8 General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect,
9 Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also
10 include a certification sheet containing the seal and signature of the Test and Balance Supervisor.

11
12 Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise
13 or drafts found during testing, adjusting and balancing. Provide recommendations for correcting
14 unsatisfactory performances and indicate whether modifications required are within the scope of the contract,
15 are design related or installation related. List instrumentation used during testing, adjusting and balancing
16 procedures.

17
18 The remainder of the report to contain the appropriate standard NEBB, AABC, or TABB forms for each
19 respective item and system. Fill out forms completely. Where information cannot be obtained or is not
20 applicable indicate same.

21
22 **PART 2 - PRODUCTS**

23
24 **INSTRUMENTATION**

25 Provide all required instrumentation to obtain proper measurements. Application of instruments and
26 accuracy of instruments and measurements to be in accordance with the requirements of NEBB, AABC, or
27 TABB Standards and instrument manufacturer's specifications.

28
29 All instruments used for measurements shall be accurate, and calibration histories for each instrument to be
30 available for examination upon request. Calibration and maintenance of all instruments to be in accordance
31 with the requirements of NEBB, AABC, or TABB Standards

32
33
34 **PART 3 - EXECUTION**

35
36 **PRELIMINARY PROCEDURES**

37 Review preconstruction meeting report, applicable construction bulletins, applicable change orders and
38 approved shop drawings of equipment, outlets/inlets and temperature controls.

39
40 Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and
41 belt tension, temperature controls for completion of installation and hydronic systems for proper charge and
42 purging of air.

43
44 **EXISTING EQUIPMENT**

45 Include testing and balancing of existing exhaust fans included in this project area.

46
47 **PERFORMING TESTING, ADJUSTING AND BALANCING**

48 Perform testing, adjusting and balancing procedures on each system identified, in accordance with the
49 detailed procedures outlined in the referenced standards except as may be modified below.

50
51 Unless specifically instructed in writing, all work in this specification section is to be performed during the
52 normal workday.

53
54 In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is
55 complete and provide new tile for any tile that are damaged by this procedure.

56
57 Cut insulation, ductwork for installation of test probes to the minimum extent necessary for adequate
58 performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier
59 integrity and pressure rating of systems.

60
61 In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway
62 between that of a clean filter and that of a dirty filter.

1 Measure and record system measurements at the fan to determine total flow. Adjust equipment as required
2 to yield specified total flow at terminals. Proceed taking measurements in mains and branches as required
3 for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers,
4 deflectors, extractors and valves prior to adjustment of terminals.
5
6 Measure and record static air pressure conditions across fans, coils and filters. Indicate in report if cooling
7 coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty
8 filter. Spot check static air pressure conditions directly ahead of terminal units.
9
10 Adjust outside air, return air dampers for design conditions at both the minimum and maximum settings and
11 record both sets of data.
12
13 Adjust register, grille and diffuser vanes and accessories to achieve proper air distribution patterns and
14 uniform space temperatures free from objectionable noise and drafts within the capabilities of the installed
15 system.
16
17
18 Final air system measurements to be within the following range of specified cfm:
19 Fans 0% to +10%
20 Supply grilles, registers, diffusers 0% to +10%
21 Return/exhaust grilles, registers 0% to -10%
22
23 Contact the HVAC Contractor for assistance in operation and adjustment of controls during testing, adjusting
24 and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report
25 description of temperature control operation and any deficiencies found.
26
27 Permanently mark equipment settings, including damper positions, control settings, and similar devices
28 allowing settings to be restored. Set and lock memory stops.
29
30 **DEFICIENCIES**
31 Division 23 00 00 contractor to correct any installation deficiencies found by the test and balance agency that
32 were specified and/or shown on the Contract Documents to be performed as part of that division of work.
33 Test and balance agency will notify the Owners Project Representative of these items and instructions will
34 be issued to the Division 23 00 00 contractor for correction of the deficient work. All corrective work to be
35 done at no cost to the Owner. Retest mechanical systems, equipment, and devices once corrective work is
36 complete as specified.
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**SECTION 23 07 00
HVAC INSULATION**

PART 1 - GENERAL

SCOPE

This section includes insulation specifications for heating, ventilating and air conditioning piping, ductwork and equipment.

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC
Section 23 07 00 - HVAC Insulation
Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
Section 23 09 14 - Controls
Section 23 31 00 – Air Ducts
Section 23 33 00 - Air Duct Accessories.
Section 23 62 13 - Air Cooled Compressor and Condensing Units
Section 23 82 00 – Heating and Cooling Units

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM C165 Test Method for Compressive Properties of Thermal Insulations
ASTM C177 Heat Flux and Thermal Transmission Properties
ASTM C195 Mineral Fiber Thermal Insulation Cement
ASTM C302 Density of Preformed Pipe Insulation
ASTM C355 Test Methods for Test for Water Vapor Transmission of Thick Materials
ASTM C518 Heat Flux and Thermal Transmission Properties
ASTM C534 Preformed Flexible Elastomeric Thermal Insulation
ASTM C547 Mineral Fiber Preformed Pipe Insulation
ASTM C553 Mineral Fiber Blanket and Felt Insulation
ASTM C612 Mineral Fiber Block and Board Thermal Insulation
ASTM C921 Properties of Jacketing Materials for Thermal Insulation
ASTM C1136 Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
ASTM D1000 Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
ASTM D1621 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics
ASTM D1940 Method of Test for Porosity of Rigid Cellular Plastics
ASTM D2126 Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
ASTM D2240 Standard Test Method for Rubber Property—Durometer Hardness
ASTM E84 Surface Burning Characteristics of Building Materials
ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems
ASTM E2336 Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems
MICA National Commercial & Industrial Insulation Standards
NFPA 225 Surface Burning Characteristics of Building Materials
UL 723 Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

Insulation systems shall be applied by experienced contractors.

DESCRIPTION

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:

- Pipe Insulation
- Duct Insulation

1 Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors
2 Association) Standard and manufacturer's installation instructions.

3 4 **DEFINITIONS**

5 Concealed: shafts, attics, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All
6 other areas, shall be considered as exposed.

7 8 **SHOP DRAWINGS**

9 Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening
10 methods, fitting materials along with material safety data sheets and intended use of each material. Include
11 manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and
12 manufacturer's installation instructions.

13 14 **ENVIRONMENTAL REQUIREMENTS**

15 Do not store insulation materials on grade or where they are at risk of becoming wet. Do not install insulation
16 products that have been exposed to water.

17
18 Protect installed insulation work with plastic sheeting to prevent water damage.

19 20 21 **PART 2 - PRODUCTS**

22 23 **MATERIALS**

24 Manufacturers: Armacell, Certainteed, Manson, Childers, Dow, Extol, Fibrex, Halstead, H.B. Fuller, Imcoa,
25 Johns Manville, Knauf, Owens-Corning, Partek, Pittsburgh Corning, Rubatex, VentureTape or approved
26 equal.

27
28 Materials or accessories containing asbestos will not be accepted.

29
30 Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame
31 spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

32
33 Pipe insulation which is not located in an air plenum may have a flame spread rating not over 25 and a
34 smoke developed rating no higher than 450 when tested in accordance with UL 723 and ASTM E84.

35 36 **INSULATION TYPES**

37 Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall
38 be suitable to receive jackets, adhesives and coatings as indicated.

39 40 **FLEXIBLE FIBERGLASS INSULATION:**

41 Minimum nominal density of 0.75 lbs. per cu. ft., and thermal conductivity of not more than 0.3 at 75 degrees
42 F, rated for service to 250 deg F.

43 44 **RIGID FIBERGLASS INSULATION:**

45 Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees
46 F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 deg F.

47 48 **ELASTOMERIC INSULATION:**

49 Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than
50 0.27 at 75 degrees F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor
51 permeability of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20
52 deg F to 220 degrees F on piping and 180 degrees F where adhered to equipment.

53 54 **JACKETS**

55 56 **FOIL SCRIM ALL SERVICE JACKETS (FSJ):**

57 Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum permeance of .02 perms
58 and minimum beach puncture resistance of 25 units.

1 **ACCESSORIES**

2 All products shall be compatible with surfaces and materials on which they are applied, and be suitable for
3 use at operating temperatures of the systems to which they are applied.

4
5 Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for
6 applications specified.

7
8 Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be
9 .015 inch for aluminum and .010 inch for stainless steel.

10 Tack fasteners to be stainless steel ring grooved shank tacks.

11
12 Staples to be clinch style.

13
14 Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

15
16 Finishing cement to be ASTM C449.

17
18 Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.

19
20 Bedding compounds to be non-shrinking and permanently flexible.

21
22 Vapor barrier coatings to have maximum applied water vapor permeance of .05 perms.

23
24 Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.

25
26
27
28 **PART 3 - EXECUTION**

29
30 **EXAMINATION**

31 Verify that all piping, equipment, and ductwork are tested and approved prior to installing insulation. Do not
32 insulate systems until testing and inspection procedures are completed.

33
34 Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

35
36 **INSTALLATION**

37 All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be
38 installed in strict accordance with manufacturer's recommendations, building codes, and industry standards.
39 Do not install products when the ambient temperature or conditions are not consistent with the manufacturer's
40 recommendations. Surfaces to be insulated must be clean and dry.

41
42 Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such
43 a manner as to protect all raw edges, ends and surfaces of insulation.

44
45 Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be
46 accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other
47 locations where insulation terminates.

48
49 Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.

50
51 Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or
52 pieces cut undersize and stretched to fit will not be accepted.

53
54 All pipe and duct insulation shall be continuous through walls, ceiling or floor openings and through sleeves
55 except where firestop or firesafing materials are required. Vapor barriers shall be maintained continuous
56 through all penetrations.

57
58 Provide a continuous unbroken moisture vapor barrier on insulation applied to systems noted below.
59 Attachments to cold surfaces shall be insulated and vapor sealed to prevent condensation.

60
61 Provide a complete vapor barrier for insulation on the following systems:

- 62 • Refrigerant
- 63
- 64

1 **PIPING, VALVE, AND FITTING INSULATION**

2 **GENERAL:**

3 Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of
4 insulation.

5
6 Where insulated piping is installed on hangers and supports, the insulation shall be installed continuous
7 through the hangers and supports. High density inserts shall be provided as required to prevent the weight of
8 the piping from crushing the insulation. Pipe shields are required at all support locations. The insulation shall
9 not be notched or cut to accommodate the supporting channels.

10
11 **ELASTOMERIC:**

12 Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings
13 allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation.
14 For elastomeric insulation, apply full bed of adhesive to both surfaces. For polyolefin, seal factory preglued
15 seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces. Cover
16 elastomeric insulation on systems operating below 40 degrees F with vapor barrier mastic.

17
18 **PIPE INSULATION SCHEDULE:**

19 Provide insulation on new piping as indicated in the following schedule:

<u>Service</u>	<u>Insulation</u>	<u>Jacket</u>	<u>Insulation Thickness by Pipe Size</u>	
			$\leq 1\text{-}1/4''$ $1\text{-}1/2''$	
Refrigerant Suction				
>40°F	Elast.	None	0.5"	1"
40°F to 20°F	Elast.	None	1"	1.5"

22
23
24
25
26
27
28 **DUCT INSULATION**

29 **GENERAL:**

30 Secure flexible duct insulation on sides and bottom of ductwork over 24" wide and all rigid duct insulation
31 with weld pins. Space fasteners 18" on center or less as required to prevent sagging.

32
33 Secure rigid board insulation to ductwork with weld pins. Apply insulation with joints firmly butted as close
34 as possible to the equipment surface. Pins shall be located a maximum of 3" from each edge and spaced no
35 greater than 12" on center.

36
37 Install weld pins without damage to the interior galvanized surface of the duct. Clip pins back to washer and
38 cover penetrations with tape of same material as jacket. Firmly butt seams and joints and cover with 4" tape
39 of same material as jacket. Seal tape with plastic applicator and secure with staples. All joints, seams, edges
40 and penetrations to be fully vapor sealed.

41
42 Stop and point insulation around access doors and damper operators to allow operation without disturbing
43 insulation or jacket material.

44
45 Where insulated ductwork is supported by trapeze hangers, the insulation shall be installed continuous
46 through the hangers. Drop the supporting channels required to facilitate the installation of the insulation.
47 Where rigid board or flexible insulation is specified, install high density inserts to prevent the weight of the
48 ductwork from crushing the insulation.

49
50 **DUCT INSULATION SCHEDULE:**

51 Provide duct insulation on new and existing remodeled ductwork in the following schedule:

Service	Insulation Type	Jacket	Insulation Thickness
Outside air ducts	Rigid Fiberglass	FSJ	2"
Mixed air ducts	Rigid Fiberglass	FSJ	2"
Exposed supply ducts	Rigid Fiberglass	FSJ	2"
Concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2"

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60 **END OF SECTION**

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SECTION 23 11 00
FACILITY FUEL PIPING

PART 1 - GENERAL

SCOPE

This section contains specifications for fuel pipe and fuel pipe fittings for this project.

RELATED WORK

Section 23 54 00 – Gas Fired Furnaces

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI B16.3 Malleable Iron Threaded Fittings
ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

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.

TYPE E OR S STEEL PIPE:

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.

QUALITY ASSURANCE

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.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

DELIVERY, STORAGE, AND HANDLING

Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

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.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system in accordance with

1 ANSI B31, but not less than 125 psig unless specifically indicated otherwise.
2

3 **NATURAL GAS SERVICE**

4 All charges for the gas service as shown on the plans, including the connection from the main in the street or
5 other location to the gas meter, shall be paid by this Contractor, including setting of gas meter(s) and all work
6 performed by the gas company.
7

8
9 **PART 2 - PRODUCTS**

10
11 **NATURAL GAS**

12 2" and Smaller: ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM
13 A197/ANSI B16.3 class 150 black malleable iron threaded fittings.
14

15 **NATURAL GAS SYSTEMS**

16
17 **SHUT OFF VALVES:**

18 2" and smaller: Ball valve, bronze body, threaded ends, chrome-plated bronze or stainless steel ball, full or
19 conventional port, teflon seat, blowout-proof stem, two-piece construction, suitable for 150 psig working
20 pressure, U.L. listed for use as natural gas shut-off.
21

22 **VENTS AND RELIEF VALVES**

23 Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.
24

25 **UNIONS AND FLANGES**

26 2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron
27 on black steel piping and galvanized malleable iron on galvanized steel piping. Use unions of a pressure class
28 equal to or higher than that specified for the fittings of the respective piping service but not less than 250 psi.
29

30
31 **PART 3 - EXECUTION**

32
33 **PREPARATION**

34 Remove all foreign material from interior and exterior of pipe and fittings.
35

36 **ERECTION**

37 Do not route piping through transformer vaults or above transformers, panelboards, or switchboards,
38 including the required service space for this equipment, unless the piping is serving this equipment.
39

40 Install all valves, and piping specialties, including items furnished by others, as specified and/or detailed.
41

42 **THREADED PIPE JOINTS**

43 Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement
44 or caulking will be allowed.
45

46 **NATURAL GAS**

47 Pitch horizontal piping down 1" in 60 feet in the direction of flow. Install a 4" minimum depth dirt leg at the
48 bottom of each vertical run and at each appliance. When installing mains and branches, cap gas tight each
49 tee or pipe end which will not be immediately extended. All branch connections to the main shall be from
50 the top or side of the main.

51 Install a shut off valve at each appliance. Provide a valved connection at the main for equipment and
52 appliances furnished by others.
53

54 Piping through a roof shall be run through an approved roof penetration with flashing and counter flashing.

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Each gas pressure reducing valve vent and relief valve vent shall be run separately to a point outside of the building, terminated with a screened vent cap, and located according to gas utility regulations.

Clean all welded piping before all regulators and control valves. Test by placing target cloth over piping and blow with compressed air. Clean piping until target cloth is clean and free of debris.

VENTS AND RELIEF VALVES

Install vent and relief valve discharge lines as indicated on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roof line.

UNIONS AND FLANGES

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.

PIPING SYSTEM LEAK TESTS

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.

On small extensions of piping that cannot be tested because of connection to an active line, Die penetrate test the piping that was not hydrostatically tested up to the active system.

END OF SECTION

1 **PIPING SYSTEM LEAKAGE TEST REPORT**

2
3
4 **Dane County**
5 **Department of Public Works**

6 **Date Submitted:** _____

7
8 **Project Name:** _____

9
10 **Location:** _____ **Project No:** _____

11
12 **Contractor:** _____

13
14 HVAC Refrigeration Controls

15 Power Plant Plumbing Sprinkler

16 **Test Medium:** Air Water Other _____

17
18 **Test performed per specification section No.** _____

19
20 **Specified Test Duration** _____ **Hours** **Specified Test Pressure** _____ **PSIG**

21
22 **System Identification:** _____

23
24 **Describe Location:** _____

25
26 _____

27	
28	
29 Test Date: _____	
30	30
31 Start Test Time: _____	31 Initial Pressure: _____ PSIG
32	32
33 Stop Test Time: _____	33 Final Pressure: _____ PSIG
34	34

35
36 **Tested By:** _____ **Witnessed By:** _____

37
38 **Title:** _____ **Title:** _____

39
40 **Signed:** _____ **Signed:** _____

41
42 **Date:** _____ **Date:** _____

43
44 **Comments:** _____

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SECTION 23 23 00
REFRIGERANT PIPING

P A R T 1 - G E N E R A L

SCOPE

This section contains specifications for all refrigerant piping for this project

RELATED WORK

Section 23 07 00 - HVAC Insulation

Section 23 54 00 - Gas Fired Furnaces

Section 23 62 13 – Packaged Air Cooled Refrigerant Compressor and Condensing Units

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

ASTM B88 Seamless Copper Water Tube

ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

ASHRAE 15 Safety Code for mechanical Refrigeration

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

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.

QUALITY ASSURANCE

Order all copper refrigeration tube with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier; with soft straight lengths or coils identified with a tag indicating that the product was manufactured in accordance with ASTM B280; and with each hard temper straight length identified throughout its length by a blue colored marking not less than 3/16 inch in height and a legend at intervals of not greater than three feet that includes the designation "ACR" and pipe outside diameter.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

DELIVERY, STORAGE, AND HANDLING

Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

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. If end caps are not present on tube bearing the "ACR" designation, clean and re-cap in accordance with ASTM B280. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA

Use only new material, free of defects and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

1 Where ASTM B88, type L hard temper copper tubing is specified, ASTM B88, type K hard temper copper
2 tubing may be substituted at Contractor's option.
3
4

5 **PART 2 - PRODUCTS**

6

7 **REFRIGERANT PIPING**

8 ASTM B88 type L hard drawn copper tube, cleaned and capped in accordance with ASTM B280, and marked
9 "ACR", with ANSI B16.22 wrought copper or forged brass solder-type fittings.
10

11 Precharged tubing line sets may be used on systems 4 tons and less in size.
12

13 **REFRIGERANT PIPING SIZING**

14 The unit manufacturer shall verify the *final refrigeration pipe sizing* process to insure conformance to
15 specific unit requirements such as max lengths, refrigerant velocities, unloading considerations and proper
16 oil return. This contractor shall provide refrigeration piping drawings from the field which details the way
17 the piping will actually be installed.
18

19 **REFRIGERANT PIPING ACCESSORIES**

20 Provide all refrigerant piping specialties with a maximum working pressure of full vacuum to 450 psig and
21 a maximum working temperature of 225 deg F. For systems using R-410A, provide all refrigerant piping
22 specialties with a maximum working pressure of full vacuum to 850 psig and a maximum working
23 temperature of 225 deg F.
24

25 Flexible pipe connectors: Double braided bronze hose flexible pipe connectors with solder end connections.
26

27 Filter Dryers: For circuits below 15 tons provide straight pattern filter dryers without replaceable core.
28

29 Sight glasses: Two piece brass construction with solder end connections. Include color indicator for sensing
30 moisture.
31

32 Solenoid Valves: Two way normally closed with two piece brass body, full port, stainless steel plug, stainless
33 steel spring, teflon diaphragm and solder end connections. Provide replaceable coil assembly.
34

35 Thermostatic Expansion Valves: Brass body, bronze disc, neoprene seat, bronze bonnet, stainless steel spring
36 and solder end connections.
37

38 Charging Valves: Provide 1/4" SAE brass male flare access ports with finger tight, quick seal caps. Provide
39 2-inch long copper extension sections.
40

41 Check valves: Spring loaded type with bronze body, bronze disc, neoprene seat, bronze bonnet, stainless steel
42 spring and solder end connections.
43
44

45 **PART 3 - EXECUTION**

46

47 **PREPARATION**

48 Remove all foreign material from interior and exterior of pipe and fittings.
49

50 **ERECTION**

51 Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a
52 window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping
53 as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling
54 heights, door and window openings, or other architectural details before installing piping.
55

1 Do not route piping through transformer vaults or above transformers, panelboards, or switchboards,
2 including the required service space for this equipment, unless the piping is serving this equipment

3
4 This requirement is based on NFPA 70, 2014 450-47.

5
6 Do not install piping running through any elevator shaft, public stairway, stair landing, or means of egress.

7
8 Install all valves and piping specialties, including items furnished by others, as specified and/or detailed.
9 Make connections to all equipment installed by others where that equipment requires the piping services
10 indicated in this section.

11
12 **REFRIGERANT PIPING**

13 Refrigeration piping to be installed by firms who are experienced in installation of such piping and in
14 accordance with the requirements of the International Mechanical Code, Chapter 11 and the Wisconsin
15 Administrative Code Chapter SPS 345.

16
17 All brazing filler metals shall have a melting temperature above 1400 degrees F and contain a minimum of
18 6% silver.

19
20 Tubing to be new and delivered to the job site with the original mill end caps in place. Clean and polish all
21 joints before brazing. Avoid prolonged heating and burning during brazing. Purge all lines with nitrogen
22 during brazing. Provide manual shut-off and check valves as required.

23
24 No refrigerant is to be vented directly to the atmosphere except that which may escape through leaks in the
25 system during leak testing. During evacuation procedures, use equipment designed to recover and allow
26 recycling of the refrigerant.

27
28 Leak test the system by charging the system to a pressure of 10 psig with an HFC refrigerant, with the
29 compressor suction and discharge valves closed and with all other system valves open. Increase pressure to
30 300 psig with dry nitrogen. Rap all joints with a mallet and check for leaks with an electric leak detector
31 having a certified sensitivity of at least one ounce per year. Seal any leaks that may be found and retest.

32
33 After completion of the leak test, evacuate the system with a vacuum pump to an absolute pressure not
34 exceeding 1500 microns while the system ambient temperature is above 60°F. Break the vacuum to 2 psig
35 with the refrigerant to be used in the system. Repeat the evacuation process, again breaking the vacuum with
36 refrigerant. Install a drier of the required size in the liquid line, open the compressor suction and discharge
37 valves, and evacuate to an absolute pressure not exceeding 500 microns. Leave the vacuum pump running
38 for not less than two hours without interruption. Raise the system pressure to 2 psig with refrigerant and
39 remove the vacuum pump.

40
41 Charge refrigerant directly from original drums through a combination filter-drier. Each drier may be used
42 for a maximum of three cylinders of refrigerant and then must be replaced with a fresh drier. Charge the
43 system by means of a charging fitting in the liquid line. Weigh the refrigerant drum before charging so that
44 an accurate record can be kept of the weight of refrigerant put in the system. If refrigerant is added to the
45 system through the suction side of the compressor, charge in vapor form only.

46
47 **REFRIGERANT PIPING ACCESSORIES**

48 Install accessories in accordance with the manufacturer's written instructions and recommendations.

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END OF SECTION

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SECTION 23 31 00
HVAC DUCTS

PART 1 - GENERAL

SCOPE

This section includes specifications for all duct systems used on this project.

RELATED WORK

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
Section 23 33 00 - Air Duct Accessories
Section 23 37 13 - Diffusers, Registers and Diffusers

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

ASTM A90	Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A623	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A527	Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
ASTM 924	Standard Specification for General Requirements for Sheet Steel, Metallic-coated by the Hot-dip Method
ASTM C 1071	Specification for Fibrous Glass Duct Lining Insulation
ASTM C 411	Test Method for Hot Surface Performance of High Temperature Thermal Insulation
ASTM E 84	Test Method for Surface Burning Characteristics of Building Materials
ASTM C 1338	Test Method for Determining Fungal Resistance of Insulation Materials and Facings
ASTM G 21	Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
ASTM C 916	Standard Specification for Adhesives for Duct Thermal Insulation
UL 181	Standard for the Installation of Air Conditioning and Ventilating Systems
NAIMA	Standard for Safety for Factory Made Air Ducts and Air Connectors. Fibrous Glass Duct Liner Standard

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include manufacturer's data and/or Contractor data for the following:

- * Duct sealant and gasket material.
- * Duct liner including data on thermal conductivity, air friction correction factor, and limitation on temperature and velocity.

DESIGN CRITERIA

Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.

Use material, weight, thickness, gauge, construction and installation methods as outlined in the following SMACNA publications, unless noted otherwise:

- * HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
- * HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012
- * HVAC Systems - Duct Design, 4th Edition, 2006
- * Round Industrial Duct Construction Standards, 2nd Edition, 1999

1 Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke
2 developed rating no higher than 50.

3
4 **DELIVERY, STORAGE AND HANDLING**

5 Promptly inspect shipments to ensure that Ductwork is undamaged and complies with the specification.

6
7 Protect Ductwork against damage.

8
9 Protect Ductwork by storing inside or by durable, waterproof, above ground packaging. Do not store material
10 on grade. Protect Ductwork from dirt, dust, construction debris and foreign material. Where end
11 caps/packaging are provided, take precautions so caps/packaging remain in place and free from damage.

12
13
14 **PART 2 - PRODUCTS**

15
16 **GENERAL**

17 All sheet metal used for construction of duct shall be 24 gauge or heavier except for round and spiral ductwork
18 and spiral duct take-offs 12" and below may be 26 gauge where allowed in SMACNA HVAC Duct
19 Construction Standards, Metal and Flexible, 3rd Edition, 2005.

20
21 Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net,
22 inside of liner.

23
24 **DUCTWORK PRESSURE CLASS**

25 Minimum acceptable duct pressure class, for all ductwork except transfer ductwork, is 2 inch W.G. positive
26 or negative, depending on the application. Transfer ductwork minimum acceptable duct pressure class is 1
27 inch W.G. positive or negative, depending on the application.

28
29 **MATERIALS**

30 **GALVANIZED STEEL SHEET:**

31 Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per
32 square foot, both sides of sheet, G90 in accordance with ASTM A90. Provide "Paint Grip" finish or
33 galvanneal sheetmetal for ductwork that will be painted.

34
35
36 **LOW PRESSURE DUCTWORK (Maximum 2 inch pressure class)**

37 Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA
38 recommendations, except as modified below.

39
40 Construct so that all interior surfaces are smooth. Use slip and drive or flanged and bolted construction when
41 fabricating rectangular ductwork. Use spiral lock seam construction when fabricating round spiral ductwork.
42 Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations
43 if the screw does not extend more than 1/2 inch into the duct.

44
45 Use elbows and tees with a center line radius to width or diameter ratio of 1.5 wherever space permits. When
46 a shorter radius must be used due to limited space, install single wall sheet metal splitter vanes in accordance
47 with SMACNA publications, Type RE 3. Where space will not allow and the C value of the radius elbow,
48 as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes as specified in
49 Section 23 33 00. Square throat-radius heel elbows will not be acceptable. Straight taps or bullhead tees are
50 not acceptable.

51
52 Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00.

53
54 Provide expanded take-offs or 45 degree entry fittings for branch duct connections with branch ductwork
55 airflow velocities greater than 700 fpm. Square edge 90-degree take-off fittings or straight taps will not be
56 accepted.

57
58 Round ducts may be substituted for rectangular ducts if sized in accordance with ASHRAE table of
59 equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by
60 written permission of the Architect/Engineer.

61
62 Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream
63 of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

1
2 **DUCT SEALANT**

3 Manufacturer: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peel & Seal, Lockformer cold
4 sealant, Mon-Eco Industries, United Sheet Metal, or approved equal. Silicone sealants are not allowed in
5 any type of ductwork installation.

6
7 Install sealants in strict accordance with manufacturer's recommendations, paying special attention to
8 temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of
9 air handling systems.

10
11 **GASKETS**

12 **2 INCH PRESSURE CLASS AND LOWER:**

13 Soft neoprene or butyl gaskets in combination with duct sealant for flanged joints.
14
15

16 **PART 3 - EXECUTION**

17
18 **INSTALLATION**

19 Verify dimensions at the site, making field measurements and drawings necessary for fabrication and
20 erection. Check plans showing work of other trades and consult with Architect in the event of any
21 interference.
22

23 Make allowances for beams, pipes or other obstructions in building construction and for work of other
24 contractors. Transform, divide or offset ducts as required, in accordance with SMACNA HVAC Duct
25 Construction Standards, Figure 4-7, except do not reduce duct to less than six inches in any dimension and
26 do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts,
27 construct easement as indicated in SMACNA HVAC Duct Construction Standards, Figure 4-8, Fig. E. In
28 all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure or
29 fume exhaust ductwork.

30 Test openings for test and balance work will be provided under Section 23 05 93.

31
32 Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room
33 or space.
34

35 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
36

37 Provide adequate access to ductwork for cleaning purposes.
38

39 Provide temporary capping of ductwork openings to prevent entry of dirt, dust and foreign material.
40

41 Protect diffusers, registers and grilles with plastic wrap or some other approved form of protection to
42 maintain dirt and dust free and to prevent entry of dirt, dust and foreign material into the Ductwork.
43

44 During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent
45 construction dust from entering ductwork system.
46

47
48 **DUCTWORK SUPPORT**

49 Support ductwork in accordance with SMACNA HVAC Duct Construction Standards, Figure 5-5, except
50 supporting ductwork with secure wire method is not allowed.
51

52 Support with 3/32 inch, 7 x 7, stainless steel air-craft cable, with matching serrated spring loaded wedge
53 mechanism fasteners rated for actual load. Steel cable hanging systems will be allowed on round ductwork
54 under 12 inches diameter if installed utilizing two fasteners with two cable loops. Comply with the
55 manufacturer's installation instructions.
56

57 **LOW PRESSURE DUCT (Maximum 2 inch pressure class)**

58 Seal all duct, with the exception of transfer ducts, in accordance with SMACNA seal class "A"; all seams,
59 joints, and penetrations shall be sealed.
60

1 Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter
2 dampers, extractors, or grille face dampers will not be accepted for balancing dampers.

3
4 Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws
5 or pop rivets. Trapeze hangers may be used at contractor's option.

6
7 **CLEANING**

8 Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the
9 inside of air-handling units before operating fans.

10
11 Clean duct systems with high power vacuum machines where systems have been used for temporary heat,
12 air-conditioning, or ventilation purposes during construction. Protect equipment that may be harmed by
13 excessive dirt with filters, or bypass during cleaning.

14
15 **LEAKAGE TEST**

16 Testing of all duct may not be necessary. Verify test requirements with A/E and Owners Project Manager,
17 if visual inspection is sufficient.

18
19 Test all ductwork in accordance with test methods described in Section 5 of SMACNA HVAC Air Duct
20 Leakage Test Manual. Do not insulate ductwork until it has been successfully tested. Test pressure shall be
21 equal to the duct pressure class.

22
23 If excessive air leakage is found locate leaks, repair the duct in the area of the leak, seal the duct, and retest.

24
25 Leakage rate shall not exceed more than 5% of the system air quantity for low pressure ductwork, determined
26 in accordance with Appendix C of the SMACNA HVAC Air Duct Leakage Test Manual.

27
28 Leakage rate shall not exceed more than 1% of the system air quantity for high pressure ductwork, determined
29 in accordance with Appendix C of the SMACNA HVAC Air Duct Leakage Test Manual.

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END OF SECTION

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SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

SCOPE

This sections includes accessories used in the installation of duct systems.

RELATED WORK

Section 23 31 00 – HVAC

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems

SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition, 1995

UL 214

UL 555 (6th edition) Standard for Fire Dampers and Ceiling Dampers

UL 555S (4th edition) Leakage Rated Dampers for Use in Smoke Control Systems

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit for all accessories and include dimensions, capacities, ratings, installation instructions, and appropriate identification.

Include certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance of sound attenuators.

Submit manufacturer's color charts where finish color is specified to be selected by the Architect/Engineer.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

MANUAL VOLUME DAMPERS

Manufacturers: Ruskin, Vent Products, Air Balance, or approved equal.

Dampers must be constructed in accordance with SMACNA Fig. 2-12, Fig. 2-13, and notes relating to these figures, except as modified below.

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.

TURNING VANES

Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley, or approved equal.

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.

1 **ACCESS DOORS**

2 Access doors to be designed and constructed for the pressure class of the duct in which the door is to be
3 installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be aluminum or steel
4 full length continuous piano type. Doors in concealed spaces shall be secured in place with cam sash
5 latches. For both hinged and non-hinged doors provide sufficient number of cam sash latches to provide
6 air tight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict access. Use
7 minimum 1” deep 24 gauge galvanized steel double wall access doors with minimum 24 gauge galvanized
8 steel frames. For non-galvanized ductwork, use minimum 1” deep double wall access door with frame that
9 shall use materials of construction identical to adjacent ductwork. Provide double neoprene gasket that shall
10 provide seals from the frame to the door and frame to the duct. When access doors are installed in insulated
11 ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent
12 ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.

13
14 Use insulated, 1-1/2 hour UL 1978 listed and labeled access doors in kitchen exhaust ducts.

15
16 **FLEXIBLE DUCT**

17 Manufacturers: Anco Products, Clevaflex, Thermaflex, Flexmaster or approved equal.

18
19 Factory fabricated , UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke
20 developed rating of 50 or under in accordance with NFPA 90A.

21
22 Suitable for pressures and temperatures involved but not less than a 180°F service temperature and ±2 inch
23 pressure class, depending on the application.

24
25 Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded
26 permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum
27 construction may also be used.

28
29 Where duct is specified to be insulated, provide a minimum 1 inch fiberglass insulation blanket with
30 maximum thermal conductance of 0.23 K (75 degrees F.) and vapor barrier jacket of polyethylene or
31 metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.

32
33 **DUCT LINING**

34
35 Manufacturer: Manville, Owens-Corning, Knauf, or approved equal.

36
37 1 inch thick, flexible, mat faced insulation made from inorganic glass fibers bonded with a thermosetting
38 resin with thermal conductivity of .25 Btu inch / hour sq.ft. deg F.

39 Meet erosion testing per UL 181 or ASTM C 1071 for 5000 fpm maximum air velocity. ASTM C 411
40 maximum operating temperature rating of 250 deg F. ASTM E84 flame spread less than 25 and smoke
41 developed less than 50.

42
43 Meet requirements of ASTM C 1338 and ASTM G21 for fungi resistance.

44
45 Install liner using adhesive conforming to ASTM C 916.

46
47 **DUCT FLEXIBLE CONNECTIONS**

48 Material to be fire retardant, be UL 214 listed, and meet the requirements of NFPA 90A.

49
50 Connections to be a minimum of 3 inches wide, crimped into metal edging strip, and air tight. Connections
51 to have adequate flexibility and width to allow for thermal expansion/contraction, vibration of connected
52 equipment, and other movement.

53
54 Use coated glass fiber fabric for all applications. Material for inside applications other than corrosive
55 environments, fume exhaust, or kitchen exhaust to be double coated with neoprene, air and water tight,
56 suitable for temperatures between -10°F and 200°F, and have a nominal weight of 30 ounces per square yard.
57 Material used for outdoor applications other than corrosive environments, fume exhaust, or kitchen exhaust
58 to be double coated with Hypalon, air and water tight, suitable for temperatures between -10°F and 250°F,
59 and have a nominal weight of 26 ounces per square yard.

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PART 3 - EXECUTION

MANUAL VOLUME DAMPERS

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).

TURNING VANES

Install turning vanes in all rectangular, mitered elbows in accordance with SMACNA standards and/or manufacturer's recommendations.

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.

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.

ACCESS DOORS

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.

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.

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.

FLEXIBLE DUCT

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.

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.

Flexible duct used to compensate for misalignment of main duct or branch duct will not be accepted.

Individual sections of flexible ductwork shall be of one piece construction. Splicing of short sections will not be accepted.

Flexible ductwork used as transfer duct shall be sized for a maximum velocity of 300 fpm.

Penetration of any partition, wall, or floor with flexible duct will not be accepted.

DUCT LINING

Apply lining to the following ductwork:

Plenums installed over return air grilles

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

1 secure liner to duct using mechanical fasteners spaced as recommended by the liner manufacturer without
2 compressing liner more than 1/8" with the fasteners.

3

4 **DUCT FLEXIBLE CONNECTIONS**

5 Install at all duct connections to rotating or vibrating equipment, including furnace unless unit is internally
6 isolated), fans, or other motorized equipment in accordance with SMACNA Figure 2-19. Install thrust
7 restraints to prevent excess strain on duct flexible connections at fan inlets and outlets; see Related Work.

8

9

10

END OF SECTION

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3 **SECTION 23 37 13**
4 **DIFFUSERS, REGISTERS & GRILLES**

5
6 **PART 1 - GENERAL**
7

8 **SCOPE**

9 This section includes specifications for air terminal equipment
10

11 **RELATED WORK**

12 Section 23 31 00 - HVAC Ducts

13 Section 23 33 00 - Air Duct Accessories

14 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
15

16 **REFERENCE**

17 Applicable provisions of Division 1 govern work under this section.
18

19 **REFERENCE STANDARDS**

20 NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

21 UL 181 - Factory-Made Air Ducts and Connectors.

22 ARI-ADC Standard 880
23

24 **QUALITY ASSURANCE**

25 Refer to division 1, General Conditions, Equals and Substitutions.
26

27 **SUBMITTALS**

28 Refer to division 1, General Conditions, Submittals.
29

30 Furnish submittal information including, but not limited to, the following:
31

32
33 Manufacturer's name and model number

34 Identification as referenced in the documents

35 Capacities/ratings

36 Materials of construction

37 Sound ratings

38 Dimensions

39 Finish

40 Color selection charts where applicable

41 Manufacturer's installation instructions

42 All other appropriate data
43

44 **DESIGN CRITERIA**

45 All performance data shall be based on tests conducted in accordance with Air Diffusion Council (ADC) Test
46 Code 1062 GRD 84.
47
48

1 **PART 2 - PRODUCTS**

2
3 **MANUFACTURERS**

4
5 Manufacturers: Carnes, Krueger, Titus, Metal-Aire, and E.H. Price.,

6
7 **SQUARE CEILING DIFFUSERS**

8
9 Based on units scheduled on the drawings

10 Steel unless otherwise indicated, louvered face furnished with frame type appropriate to installation.

11 Directional blow pattern as shown on the drawings and/or as scheduled.

12 One-piece construction louver cones with no corner joints.

13 White, baked enamel finish or powder coat finish, unless otherwise indicated.

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19 **EGGCRATE GRILLE**

20 Based on units scheduled on the drawings

21 Aluminum construction with frame type appropriate to installation.

22 Grille face 1/2" x 1/2" grid pattern 1" deep with a minimum of 85% free area.

23 Grille sizes and finishes as shown on drawings and/or as scheduled.

24 White, baked enamel finish or powder coat finish, unless otherwise indicated..

25 Screw holes on surface counter sunk to accept recessed type screws, except devices to be installed in T-bar ceiling grids shall not screw mounting holes.

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34 **PART 3 - EXECUTION**

35
36 **INSTALLATION**

37 Install grilles, registers and diffusers as shown on drawings and according to manufacturer's instructions.

38 Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.

39 Seal connections between ductwork drops and diffusers/grilles airtight.

40 Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct, paint inside of duct with flat black paint to reduce visibility.

41
42
43
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45
46
47 **END OF SECTION**

1 Centrifugal type blower fan statically and dynamically balanced with multiple speed, direct drive or belt drive
2 fan motor. Provide low energy induced draft blower for heat exchanger prepurge and combustion gas
3 venting.

4
5 Provide unit with 2" thick MERV 11 (60-65 % dust spot efficient) disposable type panel air filter and filter
6 holding rack.

7
8 Provide solid state integral control unit with all necessary controls and relays including but not limited to:

9 -Pressure switch for airflow of flue products through furnace and out vent system

10 -Rollout switch with manual reset to prevent overtemperature in burner area

11 -Electronic flame sensor

12 -Blower access safety interlock

13 -Timed blower start after main burners ignite

14 -Factory installed 24 v transformer for controls and thermostat

15 -LED's to indicate status and to aid in troubleshooting

16
17 Provide unit with matching cased "A" configuration cooling coil for upflow units, "V" configuration cooling
18 coil for downflow units, and vertical flat face configuration cooling coil for horizontal units.

19
20 Minimum 1/2" OD seamless copper tubing mechanically bonded to heavy ripple edged aluminum fins with
21 thermal expansion valve, holding charge and copper tube stubs for field piping.

22
23 Non-corrosive stainless steel or polymer drain pan with 3/4" NPT drain connection.

24
25 Steel coil casing with baked enamel finish and fiberglass insulation.

26
27 This Contractor shall provide all temperature control and interlocking necessary to perform the specified
28 control sequence. All wiring is to be in conduit in accordance with Division 26 00 00 - Electrical. All relays,
29 transformers and controls are to be in enclosures.

30
31 Provide a 7 day programmable thermostat with 2 occupied periods per day, automatic changeover, separate
32 heating and cooling set points for both occupied and unoccupied modes. Provide auxiliary controls on sub-
33 base to open minimum outside air damper and run the interlocked exhaust fans during occupied mode. Equal
34 to Honeywell model T7300 with Q7300 sub-base.

35
36 During occupied mode run the supply fan continuously, open the outside air damper, operate the interlocked
37 exhaust fans and cycle the cooling or heating as required to maintain occupied space temperature cooling or
38 heating set point. During unoccupied mode close the outside air damper, shut off the interlocked exhaust
39 fans and cycle the supply fan and cooling or heating as required to maintain unoccupied cooling or heating
40 space temperature set point.]

41 42 43 **PART 3 - EXECUTION**

44 45 **INSTALLATION**

46 Install units as shown on plans, as detailed and according to the manufacturer's installation instructions.

47
48 Pipe vents from gas regulator to outside (where regulators are provided with gas vents).

49
50 Install thermostats where indicated on the drawings. Provide all wiring between thermostats and the gas fired
51 item, outside air dampers and interlocked exhaust fans.

52 53 **FURNACES**

54 Install on concrete housekeeping pad, steel stand or suspend unit from structure as indicated on the drawings.

55 Pipe condensate to floor drain.

56
57 Provide schedule 40 PVC, ASTM D1785 combustion air and vent piping and fittings with solvent welded
58 joints as indicated on the drawings. Terminate as recommended by the furnace manufacturer.

59 60 **TRAINING**

61 Contractor to provide personnel knowledgeable with the operations, maintenance and troubleshooting of the
62 system and/or components defined within this section for a minimum period of 0.5 hours.

63
64 **END OF SECTION**

1 **DELIVERY, STORAGE AND HANDLING**

2 Comply with manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units
3 from physical damage. Leave factory-shipping covers in place until installation.

4
5 Ship units to jobsite fully assembled

6
7 **WARRANTY**

8 Provide a one year parts and labor warranty on the entire unit beginning upon substantial completion of
9 project.

10
11 Provide a five year parts warranty on the compressor(s) beginning upon substantial completion of project.

12
13
14 **PART 2 – PRODUCTS**

15
16 **UNITS UP TO 5 TONS**

17 Manufacturers: Carrier, Trane, York, McQuay or approved equal.

18
19 Units that are labeled ENERGY STAR® will be acceptable. Minimum performance shall be 13 SEER.

20
21 Provide factory assembled, outdoor mounted, air-cooled condensing unit suitable for on grade or rooftop
22 installation. Include compressor, air cooled condenser, refrigerant, lubrication system, interconnecting
23 wiring, safety and operating controls, motor starting components and additional features as specified herein
24 or required for safe, automatic operation. Capacity and steps of unloading as indicated in the equipment
25 schedule.

26
27 **CABINET**

28 Construct cabinet of heavy gauge, galvanized steel coated with weather resistant paint. Provide removable
29 access panels to facilitate full access to the compressor, fan and control components.

30
31 **COMPRESSOR**

32 Provide hermetic reciprocating or scroll type compressor with built in motor winding temperature and current
33 protection, liquid and suction service valves, gage ports, sight glass and liquid line filter dryer. Provide
34 crankcase heater with reciprocating type compressors. Mount compressors on vibration isolators.

35
36 **CONDENSER**

37 Provide condenser coils with aluminum alloy plate fins mechanically fastened to seamless copper tubing with
38 integral subcooler. Construct coils with design working pressure suitable for the refrigerant.

39
40 Provide direct-drive statically and dynamically balanced propeller type fans with vertical or horizontal
41 discharge as indicated on the drawings and guards constructed of heavy gage PVC coated wire or galvanized
42 steel.

43
44 **POWER WIRING**

45 Provide factory installed 24-volt control circuit with fusing; control power transformer and all associated
46 internal wiring. Provide a single point power connection to the unit(s). Provide factory installed magnetic
47 contactors for compressor and condenser motors.

48 Electrical characteristics shall be as indicated in the equipment schedule.

49
50 **CONTROLS**

51 Provide high/low refrigerant pressure cutouts with manual reset and anti-short cycle compressor timer.

52
53 [Unit must be capable of operating down to ambient temperature of 40 deg F. Provide low ambient lockout
54 to prevent compressor from operating below 40 degrees.]

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PART 3 - EXECUTION

INSTALLATION

Install units, piping and accessories in accordance with the manufacturer’s written instructions and recommendations. Mount unit(s) on existing support frame where existing are now located..

Charge unit(s) with full oil charge and refrigerant charge based on the entire refrigeration system pipe size and length.

Provide all control wiring in conduit in compliance with Division 26 00 00 - Electrical.

Coordinate power wiring requirements with the electrical trade.

STARTUP

Adjust units for maximum operating efficiency, adjust all controls to required final settings and demonstrate that all components are functioning properly. Submit four copies of a written startup report following the initial start up. Include in the report: work done to the system, all readings taken, a statement certifying that the refrigeration system(s) are leak free and a statement certifying that the unit(s) have been placed in proper running condition as recommended by the manufacturer and as intended in the drawings and specifications.

OWNER TRAINING

Contractor to provide personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 0.5 hours.

END OF SECTION

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SECTION 23 81 26
SPLIT-SYSTEM DUCTLESS AIR-CONDITIONERS

PART 1 - GENERAL

SCOPE

This section includes specifications for split-system ductless cooling only type systems.

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC

Section 23 23 00 – Refrigerant Piping

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

REFERENCE STANDARDS

ARI 210/240 Unitary Air Conditioning and Heat Pump Equipment

ARI 365 Commercial and Industrial Unitary Air Conditioning Condensing Units

ASHRAE 15 Safety Standard for Refrigeration Systems

ASHRAE 90.1 (2004 edition) Energy Standard for Buildings Except Low Rise Residential Buildings

NEC National Electrical Code

ASTM B117 Standard Practice for Operating Salt Spray (fog) Apparatus

UL Underwriters Laboratory

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

Unit rated performance in accordance with the latest edition of ARI Standard 365 or ARI Standard 210/240, whichever is applicable for the equipment.

Construct units in accordance with ASHRAE 15, UL standards and the NEC. Units shall carry the UL label.

Factory run and test units to see that each control device operates properly. Pressure test, evacuate, charge with holding charge of refrigerant and full oil charge prior to shipping from the factory.

SUBMITTALS

Refer to division 1, General Conditions, Submittals

Submit air cooled condensing unit and evaporative unit shop drawings including the following information: specific manufacturer and model numbers, dimensional and weight data, required clearances, materials of construction, capacities and ratings, efficiencies, stages of unloading capacity achievable without hot gas bypass, refrigerant type and charge, component information, size and location of piping connections, electrical connections, wiring diagrams and information for all specialties and accessories.

Submit manufacturer's installation and start-up instructions, maintenance data, troubleshooting guide, parts lists, controls and accessories.

At substantial completion, submit warranty certificate and copy of start-up report.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

DELIVERY, STORAGE AND HANDLING

Comply with manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units from physical damage. Leave factory-shipping covers in place until installation.

1
2 Ship units to jobsite fully assembled.
3

4 WARRANTY

5 Provide a one year parts and labor warranty on the entire unit beginning upon substantial completion of
6 project.

7 Provide a five year parts warranty on the compressor(s) beginning upon substantial completion of project.
8
9

10 PART 2 – PRODUCTS

11 UNITS UP TO 3 TONS (10.5 kW)

12 Manufacturers: Carrier, Daikin, Mitsubishi, or approved equal.
13
14

15 GENERAL

16 Provide a Cooling Only unit with an indoor ceiling or wall mounted fan coil with matched outdoor
17 condensing unit as scheduled.
18

19 Indoor fan coil units shall be complete with coil, fan, fan motor, piping connectors, electrical controls,
20 microprocessor control system, R-410A refrigerant and integral Temperature sensing. Unit shall be furnished
21 with integral wall mounting bracket and mounting hardware.
22

23 Outdoor condensing unit shall be factory assembled suitable for ground, rooftop, or wall hung mounting.
24 Units shall consist of a compressor, an air cooled coil, propeller type outdoor fan, metering device(s), and
25 control box. Units shall discharge air horizontally or vertically as shown on the drawings.
26

27 INDOOR FAN COIL UNIT (Wall/Ceiling Mounted)

28 Cabinet shall be constructed of a durable material with a galvanized steel sub-chassis. Unit shall be fully
29 insulated for improved thermal and acoustic performance.
30

31 Unit cabinet discharge and inlet grilles shall be constructed of high-impact plastic.
32

33 Fans shall be direct drive blower type with air intake and discharge on the unit. Automatic, motor driven air
34 sweep shall be provided.
35

36 Horizontal and/or vertical discharge louvers shall be adjustable.
37

38 Coils shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the
39 tubes by mechanical expansion and specially coated for enhanced wettability. A drip pan under the coil shall
40 have drain connections for hose attachment, on either the left or right hand side, to remove condensate.
41 Condensate pan shall be corrosion resistant.
42

43 Motors shall have permanently lubricated ball bearing with inherent overload protection. Fan motors shall a
44 minimum of 3 speeds.
45

46 Unit shall have filter track with factory supplied mildew proof cleanable filters.
47

48 Minimum performance shall be 16.0 SEER and 10.0 HSPF for units.
49

50 AIR-COOLED CONDENSING UNIT

51 Unit cabinet shall be constructed of galvanized steel, bonderized, and coated with a baked enamel finish on
52 the inside and outside. Unit cabinet shall be capable of withstanding 500 hour salt spray test per Federal Test
53 Standard No. 141 (method 6061). Unit access panels shall be removable with minimal screws and shall
54 provide full access to the compressor, fans, and control components. Outdoor compartment shall be isolated

1 and have an acoustic lining.
2
3 Outdoor fans shall be direct drive propeller type and shall discharge air horizontally or vertically. Outdoor
4 fan motors shall be totally enclosed, single phase motors with class B insulation and permanently lubricated
5 bearings. Motor shall be protected by internal thermal overload protection and shafts shall have inherent
6 corrosion resistance.
7
8 Fan blades shall be statically and dynamically balanced.
9
10 Outdoor fan openings shall be equipped with protective grille over fan.
11
12 Compressor shall be fully hermetic scroll or a rotary swing type variable speed compressor. Compressor shall
13 be equipped with operating oil charge, and motor. Internal overloads shall protect the compressor from over
14 temperature and over current. Motor shall be NEMA rated class F, suitable for operation in a refrigerant
15 atmosphere. Compressor assembly shall be installed on rubber vibration isolators. Compressors shall be
16 provided with crankcase heater.
17
18 Outdoor coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes, which
19 are cleaned, dehydrated, and sealed. Air cooled condenser coils shall be leak tested at 573 psig.
20
21 Refrigerant circuit components shall include service valves with service gage port connections on compressor
22 suction and discharge lines, each with brass caps, accumulator, and a reversing valve (for heat pump units).
23
24 Low Ambient Kit: Provide wind baffle and regulate fan motor cycles in response to saturated condensing
25 temperature of the unit. The control shall be capable of starting and operation down to -20 degrees F ambient
26 air temperature. Installation of kit shall not require changing the outdoor fan motor.
27
28 Condensing unit controls and safeties shall be factory selected, assembled, and tested. The minimum control
29 functions shall include the following:
30

- 31 • A time delay control sequence.
- 32 • Outdoor fan failure detection.
- 33 • Compressor motor current and temperature overload protection.
- 34 • Compressor low and high pressure protection.

35 **CONTROLS**
36 Controls shall consist of a microprocessor based control system which shall control space temperature,
37 determine optimum fan speed, and run self-diagnostics. The temperature control range shall be from 62
38 degrees F to 84 degrees F. User interface with the unit shall be accomplished through the standard wireless
39 remote control or the optional wired controller.
40
41 The unit shall have the following functions as a minimum:
42

- 43 • An automatic restart after power failure at the same operating conditions as at failure.
- 44 • A timer function to provide a minimum 24 hour timer cycle for system Auto Start/Stop.
- 45 • Temperature sensing controls shall sense return air temperature.
- 46 • Automatic air sweep control to provide on or off activation of air sweep louvers.
- 47 • Dehumidification mode shall provide increased latent removal capability by modulating system
48 operation and set point temperature.
- 49 • Fan only operation to provide room air circulation when no cooling or heating is required.
- 50 • Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions.
51 Error messages shall be displayed at the unit.
- 52 • Evaporator fan speed control shall be user selectable: high, medium, low, or microprocessor
53 controlled automatic operation during all operating modes.
- 54 • Automatic heating to cooling changeover. Control shall include dead band to prevent rapid mode
55 cycling between heating and cooling.

- A liquid level sensor in the condensate reservoir shall stop cooling operation if the liquid level in the reservoir is too high.

ELECTRICAL

Unit's electrical requirements shall be 208/230 volt, single phase, and 60 hertz.

Division 26 contractor shall provide conduit for both the power and control wiring between indoor unit and outdoor unit.

Power wiring is typically connected to the outdoor unit. Power and control wiring is required between indoor and outdoor units. Coordinate with Division 26 contractor for required connections. Costs of wiring between indoor and outdoor units shall be part of Division 23.

All power and control wiring must be installed per NEC and all local electrical codes.

COOLING COIL CONDENSATE PIPING

Provide ASTM B88, type L hard temper copper tubing with ASTM B145/ANSI B16.23 cast red bronze or ASTM B75/ANSI B16.29 wrought solder-type drainage fittings, or PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

REFRIGERANT PIPING

Provide precharged refrigerant lines that can be oriented to connect to the side or back of unit. Both refrigerant lines shall be insulated.

PART 3 - EXECUTION

INSTALLATION

Install units, piping and accessories in accordance with the manufacturer's written instructions and recommendations. Mount condensing unit(s) on a precast concrete pad on grade or wall mounting kit as indicated on the drawings.

Maintain adequate service access and airflow clearances for all components as recommended by the manufacturer and as indicated on the drawings.

Charge unit(s) with full oil charge and refrigerant charge based on the entire refrigeration system pipe size and length.

Provide all control wiring in conduit in compliance with Division 26 00 00 - Electrical.

Coordinate power wiring requirements with Division 26 00 00 contractor.

REFRIGERANT PIPING SIZING

Unit manufacturer shall verify the refrigeration pipe sizing process to insure conformance to specific unit requirements such as maximum lengths, refrigerant velocities, unloading considerations and proper oil return.

REFRIGERANT PIPING ACCESSORIES

Install accessories in accordance with the manufacturer's written instructions and recommendations.

STARTUP

Adjust units for maximum operating efficiency, adjust all controls to required final settings and demonstrate that all components are functioning properly. Submit copies of a written startup report following the initial startup.

END OF SECTION

SECTION 25 00 00

INTEGRATED ACCESS CONTROL SYSTEM (IACS)

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. This section describes the Systems Integration (SI) scope of work for the access control system project. This section also coordinates the responsibilities of the Section 28 13 00 - Access Control System Peripheral Device (ACS-PD) and Electrical trade contractors pertaining to control products or systems, furnished by each trade, that will be integrated by this Division.
- B. All labor, material, equipment and software not specifically referred to herein or on the plans, that are required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

1.03 SYSTEM DESCRIPTION

- A. The Integrated Access Control System (IACS) shall be comprised of enterprise level server/software, master access control modules (ACM) with network connectivity; two door expansion units (ACEM) connected to master control modules via an RS-485 and power trunk; card readers, door status devices, request to exit devices, emergency door releases and electronic locking hardware that in turn are connected to either master access control modules or expansion modules; power supplies and back up batteries that support the electronic locking hardware as required. The ACM shall connect to the owner's local or wide area network, depending on configuration. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each ACM shall be capable of communicating with a Niagara^{AX} Building Automation System server and enterprise level software.
- B. The SI shall provide all ACMs, ACEM's, control module enclosures, wiring riser, termination diagrams, access credentials (card or fobs), programming, and training for the IACS.
- C. The Division 28 ACS-PD Contractor shall provide all peripheral devices including but not limited to; electronic locking hardware (EL), door status sensors (DSS), proximity card readers (PCR), request to exit devices (REX), emergency door releases (EDR), fire alarm system interface (FASI), surge suppressors (SS), power supplies (PS), back up batteries (Batt), cable, cable support and labor for; mounting all enclosures/devices (including Division 25 enclosures), installation of all cabling, termination of all devices (including Division 25 devices) and 120VAC power installation as needed.

1.04 SYSTEM INTEGRATOR QUALIFICATIONS

- A. General:
 - 1. The SI shall have a successful history in the design and installation of open control systems with browser based wide area network connectivity and shall provide evidence of this history as a condition of acceptance of bid.
 - 2. The SI shall have an office that is staffed with trained engineers and technicians fully capable of providing instruction and routine emergency maintenance service on all system components within 24 hours of notification.

1 3. Contractor Service:
2

- 3 a. The SI shall have a local service facility within a 90-mile radius of the job site, staffed
4 with qualified service personnel, fully capable of providing instructions and routine or
5 emergency maintenance service.
6 b. Experience (Submit the following information as part of the proposal package):
7 i. Submit a list of no less than five similar projects that have Integrated
8 Automation Systems (IAS) installed by the System Integrator. These projects
9 must be on-line and functional such that the owner's representatives can observe
10 the IAS in full operation. Include proper references and contact numbers.
11 c. Submit an organizational diagram indicating the key technical staff proposed for the
12 project including Project Manager, Application Engineer, etc.
13 d. Qualified Bidder: Environmental Systems, Inc., 262-544-8860

14 1.05 SUBMITTAL

- 15 A. Shop drawings of the IACS system shall consist of a complete list of equipment and materials,
16 including manufacturers catalog data sheets and installation instructions. Shop drawings shall also
17 contain complete wiring and schematic diagrams, software descriptions, calculations, and any other
18 details required to demonstrate that the system has been coordinated and will properly function as a
19 system. Terminal identification for all control wiring shall be shown on the shop drawings.
20 B. Submittal shall include a network cable schematic diagram depicting, control panel locations and a
21 description of the communication type, media and protocol.
22 C. Upon completion of the work, provide a complete set of 'as-built' drawings and application software
23 on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight
24 copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk.
25 Division 28 and 25 contractors shall provide as-builts for their portions of work. Division 25
26 contractor shall be responsible for as-builts pertaining to overall IACS architecture and network
27 diagrams.

28 1.06 SPECIFICATION NOMENCLATURE

- 29 A. Acronyms used in this specification are as follows:
30 1. ACS Access Control System
31 2. ACM Access Control Module
32 3. ACEM Access Control Expansion Module
33 4. ACS-PD Access Control System-Peripheral Device
34 5. AWG American Wire Gauge
35 6. BAS Building Automation System
36 7. DSS Door Status Sensor
37 8. EDR Emergency Door Release
38 9. EL Electronic Locking Hardware
39 10. FASI Fire Alarm System Interface
40 11. FMCS Facility Management Control System
41 12. IACS Integrated Access Control System
42 13. IOM Input/Output Module
43 14. LAN Local Area Network
44 15. NS Network Supervisor
45 16. PCR Proximity Card Reader
46 17. PD Peripheral Device

- 1 18. PR Proximity Card Reader
- 2 19. PS Power Supply
- 3 20. REX Request to Exit Device
- 4 21. SI Systems Integrator
- 5 22. SSI Sub System Interface
- 6 23. WAN Wide Area Network

7 1.07 DIVISION OF WORK

- 8 A. The SI shall be responsible for providing all ACMs, ACEMs, control panels, controller programming, controller programming software, enterprise level servers and wiring diagrams.
- 9
- 10 B. The SI shall be responsible for integration sequences between the ACS and BAS, global supervisory control applications as may be required, system integration and coordination of the point to point check out with the ACS-PD Contractor.
- 11
- 12
- 13 C. The point of demarcation for the products to be provided by the SI shall be up to and including the ACMs, ACEMs, enterprise level software/licensing and associated enclosures.
- 14

15 1.08 WORK INCLUDED

- 16 A. Furnish and install the following application software as outlined in this section.
- 17 1. User Interface software
- 18 2. License upgrade software
- 19 B. The following will be coordinated with the owner:
- 20 1. Provide set-up and development of the software to provide the functional and performance requirements specified herein.
- 21
- 22 2. Provide development of access levels, time schedule, naming conventions, user rights and integration sequences as may be required.
- 23

24 1.09 AGENCY AND CODE APPROVALS

- 25 A. All products of the IACS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
- 26
- 27
- 28 1. FCC, Part 15, Subpart J, Class A Computing Devices

29 1.10 RELATED WORK SPECIFIED ELSEWHERE

- 30 A. Section 28 13 00, ACS-PD Contractor:
- 31 1. Providing peripheral devices and interfaces including but not limited to:
- 32 a. Proximity Card Readers
- 33 b. Electronic Locking Hardware
- 34 c. Door Status Sensors
- 35 d. Request to Exit Devices
- 36 e. Emergency Door Releases
- 37 f. Surge Suppression
- 38 g. Fire Alarm System Interface
- 39 h. Power Supplies
- 40 i. Sub-system Interface
- 41 j. Cabling
- 42 k. Installation Labor
- 43 l. Device wiring terminations

1 1.11 SOFTWARE LICENSE AGREEMENT

- 2 A. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing
3 agreement as a condition of this contract. Such license shall grant use of all programs and application
4 software to Owner as defined by the manufacturer's license agreement, but shall protect
5 manufacturer's rights to disclosure of trade secrets contained within such software.
- 6 B. It is the owner's expressed goal to implement an IACS that shall allow access control and occupancy
7 data to be integrated into a FMCS in order to provide improved energy management and security.
8 The Owner shall be the named license holder of all software associated with any and all incremental
9 work on the project(s). In addition, the Owner shall receive use of all job specific configuration
10 documentation, data files, and application-level software developed for the project. This shall include
11 all custom, job specific software code and documentation for all configuration and programming that
12 is generated for a given project and/or configured for use with the ACM and any related LAN / WAN
13 / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for
14 access to any component or software program shall be provided to the owner.

15 1.12 DELIVERY, STORAGE AND HANDLING

- 16 A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons
17 through shipping, storage, and handling as required to prevent equipment damage. Store equipment
18 and materials inside and protected from weather.

19 1.13 JOB CONDITIONS

- 20 A. Cooperation with Other Trades: Coordinate the Work of this division with that of other divisions to
21 insure that the Work will be carried out in an orderly fashion. It shall be the SI's responsibility to
22 check the Contract Documents for possible conflicts between his Work and that of other crafts in
23 equipment location, conduit runs, electrical feeds and structural or architectural features.

24 PART 2 - MATERIALS

25 2.01 GENERAL

- 26 A. The Integrated Access Control System (IACS) shall be comprised of a network of interoperable,
27 stand-alone ACMs/ACEMs, servers, operator workstations, network devices and other devices as
28 specified herein.
- 29 B. The installed system shall provide secure password access to all features, functions and data contained
30 in the overall IACS.

31 2.02 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

- 32 A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed access
33 control system with the capability to integrate to the existing building automation system via Ethernet
34 using one of the following protocols: BACnet IP, oBIX, or Niagara^{AX} Fox.
- 35 B. The supplied system must incorporate the ability to access all data using standard Web browsers
36 without requiring proprietary operator interface and configuration programs and shall employ
37 component-oriented technology (COT) for representation of all data and control devices within the
38 system. In addition, adherence to industry standards is required to assure interoperability between all
39 system components. For each BACnet ANSI / ASHRAETM Standard 135-2004 system, the system
40 supplier must provide a PICS document showing the installed systems compliance level. Physical
41 connection of BACnet devices shall be via Ethernet using BACnet/IP. BACnet MSTP shall not be
42 acceptable as a means to integrate the IACS with a FMCS or BAS
- 43 C. A hierarchical topology is required to assure reasonable system response times and to manage the
44 flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems
45 employing a "flat" single tiered architecture shall not be acceptable.

46 2.03 NETWORKS

- 1 A. The Local Area Network (LAN) shall be a 100 Mb minimum Ethernet network for maximum
2 flexibility for integration of building data with enterprise information systems and providing support
3 for multiple ACMs, user workstations and, a local server.
- 4 B. Local area network minimum physical and media access requirements:
- 5 1. Ethernet; IEEE standard 802.3
 - 6 2. Cable; 10 Base-T, UTP-8 wire, category 5E or 6
 - 7 3. Minimum throughput; 10 MB, with ability to increase to 1 GB

8 2.04 NETWORK ACCESS

- 9 A. Remote Access.
- 10 1. For Local Area Network installations, provide access to the LAN from a remote location, via
11 the Internet. The owner shall provide a connection to the Internet to enable this access via
12 high-speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1
13 Line or via the customer's Intranet, to a corporate server providing access to an Internet
14 Service Provider (ISP). Owner agrees to pay monthly access charges for connection and ISP.

15 2.05 ACCESS CONTROL MODULE (ACM)

- 16 A. The SI shall supply one or more ACMs as part of this contract. The number of ACMs required is
17 dependent on the type, location and quantity of peripheral devices provided under Section 28 13 00.
18 It is the responsibility of the SI to coordinate with the Section 28 13 00 ACS-PD Contractor to
19 determine the quantity and type of devices.
- 20 B. The ACM shall be a Tridium Vykon model SEC-J-601 or equal
- 21 C. The ACM shall provide the interface between the LAN/WAN, ACEMs and remote input/output
22 devices as well as provide global supervisory access control functions over the all devices connected
23 to the ACM. The ACM shall provide multiple user access to the system. The ACM shall support
24 standard Web browser access via the Intranet/Internet.
- 25 D. The ACM shall be capable of executing common application control programs to provide:
- 26 1. Calendar functions.
 - 27 2. Scheduling.
 - 28 3. Event and Credential database reporting.
 - 29 4. Alarm monitoring and routing.
 - 30 5. Time synchronization.
 - 31 6. Integration via BACnet, Niagara^{AX} Fox or Obix.
- 32 E. The ACM must provide the following hardware features as a minimum:
- 33 1. IBM/AMCC PowerPC 405EP 266 MHz processor or equal.
 - 34 2. 128MB SDRAM & 64MB NAND Flash.
 - 35 3. Two (2) Ethernet ports – 10/100 Mbps.
 - 36 4. One (1) RS-485 port.
 - 37 5. Capable to operate over a temperature range of +35F to +122F (+2C to +50C) and a humidity
38 range of 0 to 95% RH, non-condensing.
 - 39 6. Optional Autodial 56 Kbps modem slot.
 - 40 7. Support fifteen (15) additional remote modules, mix and match any combination of ACEMs
41 and Input/Output Modules (IOM).
 - 42 8. Support two (2) card readers, 6 supervised inputs, 4 digital output relays, 1 unsupervised input
43 for cabinet tamper detection, 1 unsupervised input for external power source AC power fail
44 and 1 unsupervised input for battery low detection.
 - 45 9. The ACM shall provide an integrated battery backup to provide sufficient time for an orderly
46 system shutdown in the event of a power failure. The NSC shall provide a minimum 4 hours

1 backup operation to the IACS while operating on battery backed power.

2 10. The ACM shall be mounted in a key locked, tamper switch protected metal enclosure with the
3 following requirements:

4 a. The cabinet shall be suitable for wall mounting and contain a removable door for ease
5 of installation.

6 b. The cabinet shall be suitably sized to allow installation of the controller and additional
7 expansion modules if required.

8 2.06 ACCESS CONTROL EXPANSION MODULE

9 A. The SI shall supply one or more ACEMs as part of this contract. The number of ACEMs required is
10 dependent on the type, location and quantity of devices provided under Section 28 13 00. It is the
11 responsibility of the SI to coordinate with the Section 28 13 00 ACS-PD Contractor to determine the
12 quantity and type of devices.

13 B. The ACEM shall be Tridium Vykon model SEC-R2R or equal.

14 C. The ACEM shall support 2 access control reader ports, 4 supervised inputs and 2 digital output relays.

15 D. The ACEM shall communicate with the ACM via an RS-485 bus.

16 E. The ACEM shall be capable of operation over a temperature range of +35F to +122F (+2C to +50C)
17 and a humidity range of 0 to 95% RH, non-condensing.

18 2.07 INPUT/OUTPUT MODULE (IOM)

19 A. The IOM shall be Tridium Vykon model SEC-RIO or equal.

20 B. The IOM shall provide inputs and outputs to monitor and control non-reader-based system points,
21 such as door contacts, motion sensors, gate actuators, etc.

22 C. The IOM shall support 8 supervised four-state inputs (open, closed, short and cut), 8 digital output
23 Form C relays, 1 alarm input point for cabinet tamper detection and 1 alarm input point for external
24 power source AC fail / battery low detection.

25 D. The IOM shall communicate with the ACM via an RS-485 bus.

26 E. The IOM shall be capable of operation over a temperature range of +35F to +122F (+2C to +50C) and
27 a humidity range of 0 to 95% RH, non-condensing.

28 2.08 Backup Batteries (Batt)

29 A. Backup battery power shall be provided for all system components such that the entire system will
30 function normally for a period of no less than 4 hours from the loss of AC power.

31 2.09 WEB BROWSER CLIENTS

32 A. The system shall be capable of supporting no less than ten (10) concurrent users and up to twenty-five
33 (25) with the use of a network supervisor, using a standard Web browser such as Internet Explorer™,
34 Mozilla Firefox™, etc. Systems requiring additional software (to enable a standard Web browser) to
35 be resident on the client machine, or manufacturer-specific browsers shall not be acceptable.

36 B. The Web browser software shall run on any operating system and system configuration that is
37 supported by the Web browser. Systems that require specific machine requirements in terms of
38 processor speed, memory, etc., in order to allow the Web browser to function with the IAS, shall not
39 be acceptable.

40 C. The Web browser client shall support at a minimum, the following functions:
41 User log-on identification and password shall be required. If an unauthorized user attempts access, a
42 blank web page shall be displayed. Security using Java authentication and encryption techniques to
43 prevent unauthorized access shall be implemented.

1 2.10 NETWORK SUPERVISOR FUNCTIONS AND HARDWARE

- 2 A. A Network Supervisor (NS) shall be provided, where more than two ACMs are applied to an
3 enterprise application. The NS shall support all Access Control Modules (ACMs) connected to the
4 control LAN/WAN.
- 5 B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1.
6 The owner's wide area network (WAN) shall not be used.
- 7 C. It shall be possible to provide access to all ACMs via a single connection to the Network Supervisor.
- 8 D. The Network Supervisor shall provide the following functions, at a minimum:
- 9 1. Global Data Access: The Network Supervisor shall provide complete access to distributed data
10 defined anywhere in the system.
 - 11 2. Distributed Control: The Network Supervisor shall provide the ability to execute global control
12 strategies based on control and data objects in any ACM in the network, local or remote.
 - 13 3. The Network Supervisor shall include a master clock service for its subsystems and provide
14 time synchronization for all ACMs.
 - 15 4. The Network Supervisor shall accept time synchronization messages from trusted precision
16 Atomic Clock Internet sites and update its master clock based on this data.
 - 17 5. The Network Supervisor shall provide scheduling for all ACMS and their ACEMs.
 - 18 6. The Network Supervisor shall provide central alarm management for all ACMs supported by
19 the Network Supervisor. Alarm management shall include:
 - 20 a. Routing of alarms to display, printer, email and pagers
 - 21 b. View and acknowledge alarms
 - 22 c. Query alarm logs based on user-defined parameters
 - 23 7. The Network Supervisor shall provide central management of log data for all ACMS supported
24 by the Network Supervisor. Log data shall include process logs, runtime and event counter
25 logs, audit logs and error logs. Log data management shall include:
 - 26 a. Viewing and printing log data
 - 27 b. Exporting log data to other software applications
 - 28 c. Query log data based on user-defined parameters
- 29 E. Network Supervisor Hardware Requirements: The Network Supervisor hardware platform shall have
30 the following requirements:
- 31 1. The computer platform shall comply with the current server standards as defined by the
32 Owner's BIS department.
 - 33 2. When attaching the Network Supervisor to the owner's wide area network, the Network
34 Supervisor must be equipped with Network Client software that conforms to the Owner's BIS
35 standard.
 - 36 3. The Network Supervisor operating system shall be Microsoft Windows XP Professional.
37 Include Microsoft Internet Explorer 6.0 or later.
 - 38 4. Connection to the IAS network shall be via an Ethernet network interface card, 100Mbps.

39 2.11 ENTERPRISE SYSTEM CAPACITIES

- 40 A. The IACS software shall support the following features and be configured for a minimum of the
41 following:
- 42 1. 1,000,0000 Personnel Records
 - 43 2. 50,0000 Buffered Transactions of System Events
 - 44 3. 16 Programmable Wiegand Card Formats
 - 45 4. 25,000 Access Levels (15 per card holder)
 - 46 5. 25,000 Access Zones

- 1 6. 1,500 Schedules
- 2 7. 6 ACM Supported (Max 500)

3 PART 3 - EXECUTION

4 3.01 INSTALLATION

- 5 A. All work described in this section shall be performed by a system integrator that has a successful
- 6 history in the design and installation of integrated control systems. The installing office shall have a
- 7 minimum of five years of integration experience and shall provide documentation in the submittal
- 8 package verifying the company's experience.
- 9 B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the
- 10 project drawing set.
- 11 C. Drawings of IACS network are diagrammatic only and any apparatus not shown, but required to make
- 12 the system operative to the complete satisfaction of the Architect shall be furnished and installed
- 13 without additional cost.
- 14 D. Line and low voltage electrical connections to control equipment shown specified or shown on the
- 15 control diagrams shall be furnished and installed by the ACS-PD contractor in accordance with the
- 16 specifications in Section 28 13 00.

17 3.02 WIRING

- 18 A. All electrical control wiring and power wiring to the ACMs/ACEMs, computers and network
- 19 components (routers, hubs, switches, etc.) shall be the responsibility of the Section 28 13 00, ACS-PD
- 20 Contractor.
- 21 B. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National
- 22 Electrical Code and any applicable local codes. All IAS wiring shall be installed in the conduit types
- 23 specified in the Project Electrical Specifications (Division 26) unless otherwise allowed by the
- 24 National Electrical Code or applicable local codes. Where IACS plenum rated cable wiring is
- 25 allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in
- 26 a neat and workmanlike manner.

27 3.03 WARRANTY

- 28 A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of
- 29 one year from the time of system acceptance.
- 30 B. Within this period, upon notice by the Owner, any defects in the work provided under this section due
- 31 to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after
- 32 receipt of notice) repaired or replaced by the System Integrator at no expense to the Owner.

33 3.04 WARRANTY ACCESS

- 34 A. The Owner shall grant to the System Integrator, reasonable access to the IAS during the warranty
- 35 period. The owner shall allow the contractor to access the IAS from a remote location for the purpose
- 36 of diagnostics and troubleshooting, via the Internet, during the warranty period.
- 37

1 3.05 ACCEPTANCE TESTING

- 2 A. Upon completion of the installation, the System Integrator shall load all system software and start-up
3 the system. The ACS-PD contractor (Section 28 13 00) shall perform all necessary testing and de-
4 bugging and perform all required operational checks to insure that the system is functioning in full
5 accordance with these specifications. The ACS-PD Contractor (Section 28 13 00) and the System
6 Integrator (Section 25 00 00) are to coordinate the checkout of the system such that each Division has
7 a representative present during system checkout.
- 8 B. The ACS-PD Contractor shall perform tests to verify proper performance of components and points.
9 Repeat tests until proper performance results. This testing shall include a point-by-point log to
10 validate 100% of the input and output points of the IACS operation. The System Integrator shall have
11 a representative present during system checkout by the ACS-PD Contractor. The System Integrator
12 shall coordinate and comply with the start-up and checkout schedule of the ACS-PD Contractor. The
13 ACS-PD Contractor shall give a minimum of two (2) weeks advance notice to the System Integrator,
14 of the startup schedule and plan.
- 15 C. Upon completion of the performance tests described above, repeat these tests, point by point as
16 described in the validation log above in presence of Owner's Representative, as required. Properly
17 schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not
18 delay tests so as to prevent delay of occupancy permits or building occupancy.
- 19 D. System Acceptance: Satisfactory completion is when the ACS-PD Contractor and the System
20 Integrator have successfully performed all the required testing to show performance compliance with
21 the requirements of the Contract Documents to the satisfaction of the Owner's Representative.
22 System acceptance shall be contingent upon completion and review of all corrected deficiencies.

23 3.06 OPERATOR INSTRUCTION, TRAINING

- 24 A. The System Integrator shall provide a minimum of 16 hours of instruction to the owner's designated
25 personnel on the operation of the IACS and describe its intended use with respect to the programmed
26 functions specified. Operator orientation of the IACS shall include, but not be limited to; the overall
27 operation program, equipment functions (both individually and as part of the total integrated system),
28 commands, systems generation, advisories, and appropriate operator intervention required in
29 responding to the System's operation.
- 30 B. The training shall be in two sessions as follows:
- 31 1. Initial Training: One day session (8 hours) after system is started up and at least one week
32 before first acceptance test.
- 33 2. Follow-Up Training: One day session (8 hours) approximately two weeks after final system
34 commissioning. This session will deal with more advanced topics and answer questions as
35 requested by the owner. Topics covered will include but are not limited to: how to add
36 credentials/users, create time schedules and access levels, generate user activity reports, etc...

37 PART 4 - SEQUENCES OF OPERATION - SPECIAL

38 4.01 SUMMARY

- 39 A. The System Integrator shall refer to this Item under Section 28 13 00 to determine what level of
40 control functionality the ACM/Network Supervisor (NS), must provide. It is the responsibility of the
41 System Integrator to coordinate control functions, such as scheduling and supervisory-level global
42 control with the ACS-PD contractor.
43

44
45 END OF SECTION 25 00 00

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SECTION 26 05 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 GENERAL PROVISIONS

- A. In general, the work includes: Electrical work and the kindred materials and operations as indicated on the drawings and as specified in the following articles of:
 - Section 25 00 00 Integrated Access Control System
 - Section 26 05 00 General Electrical Requirements
 - Section 26 09 23 Occupancy Sensor
 - Section 26 20 00 Basic Materials and Methods
 - Section 26 31 10 Photovoltaic Generating System
 - Section 26 31 11 Mounting Structures for Solar Modules
 - Section 26 31 12 Photovoltaic Panels
 - Section 26 43 13 Transient Voltage Surge Suppression
 - Section 26 51 13 Lighting
 - Section 27 10 00 Telecommunications Distribution System
 - Section 28 13 00 Access Control Intrusion Detection
 - Section 28 31 00 Fire Alarm System
- B. Job Information: Obtain at building including:
 - 1. Conditions affecting this Section of the Work.
 - 2. Accessibility
 - 3. Storage space.

1.03 GENERAL REQUIREMENTS

- A. This Section of the Specifications applies to all electrical work. The General Conditions, Supplementary Conditions, Summary of the Work, Instructions to Bidders and all Sections of the Conditions of the Contract form a part of these specifications and the Contractor shall consult them in detail. Electrical work indicated in other Sections of the Specifications to be done by the Electrical Contractor shall be included in the Work of this Section.

1.04 DEFINITIONS

- A. Certain terms used herein; on the drawings; and in the contract documents, shall be defined as follows:
- B. Provide: Furnish and install complete and ready for service.
- C. Exposed: Exposed to view in any room, hallway, passageway, or outside.
- D. Approval: The approval of the Architect in writing or by signed rubber stamp applied to drawings, illustrations, etc.

1.05 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

1 1.06 DRAWINGS

- 2 A. The Electrical drawings do not attempt to show the complete details of building construction which
3 affect the electrical installation. The Contractor shall refer to the architectural, civil, structural and
4 mechanical drawings for additional details which affect the proper installation of this work. The
5 Contractor is cautioned that diagrams showing electrical connections and/or circuiting are
6 diagrammatic only and must not be used for obtaining lineal runs of wire to conduit. Wiring diagrams
7 do not necessarily show the exact physical arrangement of the equipment.

8 1.07 MATERIAL AND EQUIPMENT

- 9 A. All material and equipment shall be new and of the quality used for the purpose in good commercial
10 practice, and shall be standard product of reputable manufacturers. Each major component of
11 equipment shall have the manufacturer's name, catalog number, and capacity or rating on a nameplate,
12 securely affixed on the equipment in a conspicuous place.

13 1.08 SUBSTITUTION AND APPROVAL OF MATERIAL

- 14 A. See Instructions to Bidders.
15 B. Such requests shall be accompanied by three copies of all necessary illustrations, cuts, drawings and
16 descriptions of material proposed for substitution and shall fully describe all points in which it differs
17 from the articles specified. Two copies will be retained by the Architect and one copy returned to the
18 Contractor with approval or revisions indicated thereon.

19 1.09 DAMAGE TO OTHER WORK

- 20 A. The Electrical Contractor will be held rigidly responsible for all damages to the work of his own or
21 any other trade resulting from the execution of his work. It shall be the Contractor's responsibility to
22 adequately protect his work at all times. All damages resulting from his operations shall be repaired
23 or the damaged portions replaced by the party originally performing the work, (to the entire
24 satisfaction of the Architect), and all cost thereof shall be borne by the Contractor responsible for the
25 damage.

26 1.10 COOPERATION WITH OTHER TRADES

- 27 A. This Contractor shall completely cooperate with all other trades in the matter of planning and
28 executing of the work. Every reasonable effort shall be made to prevent conflict and interferences as
29 to space requirements, dimensions, locations, openings, sleeving or other matters which tend to delay
30 or obstruct the work of any trade.

31 1.11 NEGLIGENCE

- 32 A. Should the Contractor fail to provide materials, templates, etc., or other necessary information causing
33 delay or expense to another party, he shall pay the actual amount of the damages to the party who
34 sustained the loss.

35 1.12 FIELD CHANGES

- 36 A. Should any change in drawings or specifications be required to comply with local regulations and/or
37 field conditions, the Contractor shall refer same to Architect for approval before any work which
38 deviates from the original requirements of the drawings and specifications is started. In the event of
39 disagreements as to the necessity of such changes, the decision of the Architect shall be final.

40 1.13 CUTTING AND PATCHING IN NEW CONSTRUCTION

- 41 A. As necessary and with approval to permit the installation of conduit or any part of the work under this
42 branch. Any cost caused by defective or ill-timed work shall be by the party responsible therefor.
43 Patching of holes, openings, etc. resulting from the work of this branch shall be furnished by this
44 contractor.
45 B. See Division 1 for additional requirements.

1 1.14 COMPLETION DATES

- 2 A. This Contractor shall be in a position to meet all completion dates established by the Architect and
3 shall furnish all labor of all classes required to meet such schedules and completion dates.

4 1.15 STANDARDS, CODES AND PERMITS

- 5 A. All work shall be installed in accordance with National, State and Local electrical codes, laws,
6 ordinances and regulations. Comply with all applicable OSHA regulations.
- 7 B. All materials shall have a U.L. label where a U.L. standards and/or test exists.
- 8 C. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and
9 working drawings required by them.
- 10 D. Secure and pay for all permits and licenses required.

11 1.16 CLEAN-UP

- 12 A. This Contractor shall at all times keep the premises free from excessive accumulation of waste
13 material or rubbish resulting from his work, including tools, scaffolding and surplus materials, and he
14 shall leave his work broom clean or its equivalent.
- 15 B. In case of dispute, Architect may order the removal of such rubbish and charge the cost to the
16 responsible contractor as determined by the Architect. At the time of final clean-up all fixtures and
17 equipment shall be thoroughly cleaned and left in proper condition for their intended use.

18 1.17 TESTS

- 19 A. The Contractor shall provide all instrumentation, labor and conduct all tests required by the Architect.
20 All tests shall be made before any circuit or item of equipment is permanently energized. Circuits
21 shall be phased out and loads shall be distributed as evenly as possible on all phases. All phase
22 conductors shall be entirely free from grounds and short circuits. All instrumentation and personnel
23 required for testing shall be provided by the Contractor and all tests shall be conducted in the presence
24 of the Architect or his authorized representative.
- 25 B. System Tests:
- 26 1. The following tests are required prior to energization of the electrical system:
- 27 a. Secondary feeders shall have an insulation resistance test utilizing a megger applying a
28 test potential of 500 volts DC minimum.
- 29 b. Establish secondary phase to ground voltages.
- 30 c. Establish proper phase relationship and motor rotation.
- 31 2. The following tests are required under normal load condition:
- 32 a. Record secondary phase to phase and phase to ground voltages and phase currents at all
33 major equipment, apparatus, and on all secondary feeders. Voltage readings shall be
34 taken at line side terminals of distribution centers and panelboards.
- 35 b. Confirm proper phase relationship and motor rotation.
- 36 c. Confirm load balance at distribution centers and panels. Rebalance load if necessary
37 such that the minimum unbalance between phases shall not exceed 7-1/2%.
- 38 d. Confirm operation of all electrically operated apparatus, such as circuit breakers,
39 transfer switches, etc., by exercising same under load.
- 40 e. Record all settings and calibrations of circuit breakers, transfer switches, transformers,
41 meters, timing devices, etc.
- 42

1 C. Records:

- 2 1. All test data obtained by the E.C. or manufacturer/supplier shall be recorded and filed with the
3 maintenance manual as part of permanent job records. Test data shall include identification of
4 instruments employed (field test only), condition of test (time, date, weather, etc.), parameters
5 of test, personnel conducting test, and any pertinent information or conditions noted during the
6 test.

7 1.18 SHOP DRAWINGS

8 A. Submit to Engineer for review, copies of manufacturer's shop drawings and/or equipment brochure
9 depicting:

- 10 1. Lighting Fixtures
11 2. Panelboards
12 3. Occupancy Sensors
13 4. Telecommunications Equipment and Cabling
14 5. Wiring Devices
15 6. Doorbells
16 7. Photovoltaic system
17 8. Fire Alarm System
18 9. Transient Voltage Surge Suppressor
19 10. Other materials at the request of the Engineer

20 B. See Section 01300.

21 C. Shop drawings shall bear the Contractor's stamp indicating approval.

22 D. Any equipment fabrication prior to shop drawing review shall be at the Contractor's risk.

23 1.19 WORKMANSHIP

- 24 A. The installation of all work shall be made so that its several component parts will function as a
25 workable system complete with all accessories necessary for its operation, and shall be left with all
26 equipment properly adjusted and in working order. The work shall be executed in conformity with
27 the best accepted standard practice of the trade so as to contribute to efficiency and appearance. It
28 shall also be executed so that the installation will conform and adjust itself to the building structure,
29 its equipment and its usage.

30 1.20 DRAWINGS OF OTHER TRADES

- 31 A. The Contractor shall consult the drawings of the work for the various other trades; field layouts of the
32 parties performing the work of the other trades; their shop drawings, and he shall be governed
33 accordingly in laying out his work.
- 34 B. Specifically examine shop drawings to confirm voltage, current characteristics, and other wiring
35 requirements for utilization equipment. Bring any discrepancies to the attention of the A/E.

36 1.21 FIELD MEASUREMENTS

- 37 A. The Contractor shall take all field measurements necessary for his work and shall assume the full
38 responsibility for their accuracy.

39 1.22 STRUCTURAL INTERFERENCES

- 40 A. Should any structural interferences prevent the installation of the outlets, running of conduits, etc., at
41 points shown on drawings, the necessary minor deviation therefrom, as determined by the Architect,
42 may be permitted. Minor changes in the position of the outlets or equipment if decided upon before
43 any work has been done by the Contractor shall be made without additional charge.
44

1 1.23 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE

- 2 A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all features of
3 the building and site which may affect the execution of his work. No extra payment will be allowed
4 for the failure to obtain this information. If in the opinion of the Contractor there are omissions or
5 errors in the plans or specifications, the Contractor shall clarify these points with the Architect before
6 submitting his bid. In lieu of written clarification by addendum, resolve all conflicts in favor of the
7 greater quantity or better quality.

8 1.24 GUARANTEE

- 9 A. The Contractor shall unconditionally guarantee his work and all components thereof, excluding
10 lamps, for a period of one year from the date of his final payment. He shall remedy any defects in
11 workmanship and repair or replace any faulty equipment which shall appear within the guarantee
12 period to the entire satisfaction of the Architect at no additional charge.

13 1.25 TEMPORARY WIRING AND SERVICE

- 14 A. Provide temporary service from existing service. Temporary service shall support construction
15 activities.
- 16 B. All contractors shall provide and maintain their own extension cords and additional lamps as required
17 to perform his work properly. Contractors requiring temporary connections to 3 phase power service
18 and single phase feeders for other than lighting and small fractional horsepower motorized tools shall
19 make arrangement with the Electrical Contractor. Contractors requiring lighting outside of the
20 building shall make their own arrangements with the Electrical Contractor and pay all costs for
21 installation, maintenance and removal. Contractors requiring electrical equipment over one HP,
22 including welders, hoists, heaters and coolers shall make their own arrangements for such service
23 beyond the main switch and shall pay all costs thereof.
- 24 C. No permanent electrical equipment or wiring shall be used for temporary connections, unless
25 authorized by this Section, upon signed order and with approval by the Architect in behalf of the
26 Owner. Such approvals shall not shorten guarantee period.
- 27 D. Electrical energy to be paid for by owner.

28 1.26 ELECTRICAL SERVICE

- 29 A. The service is existing and provides 208Y/120 volts, three phase, four wire.

30 1.27 BRANCH CIRCUIT WIRING

- 31 A. See plans for general arrangement of circuits, conduit runs, and ratings of branch circuits and special
32 circuits.
- 33 B. Provide everything necessary to comply with the general scheme shown, including all types of
34 control.
- 35 C. Circuit numbers as shown on plans are for contractor to plan his wiring and for estimating purposes.
36 These numbers are not necessarily consecutive numbers of the panelboard breakers. Balanced load on
37 bus is to be the determining factor in arrangement of circuits. Balance loading to within 7 1/2%.
- 38 D. Minimum size of lighting system branch circuit conductors to be #12 AWG.
- 39 E. Conductors terminating at wired outlets shall extend at least eight (8) inches beyond outlet box
40 conduit fitting.
- 41 F. 120 volt circuit home runs greater than 50 feet in length shall have #10 AWG minimum size between
42 panel and first receptacle or fixture outlet.
- 43 G. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All
44 branch circuits will be furnished and installed with an individual accompanying neutral, sized the
45 same as the phase conductors

1 1.28 MOTOR WIRING

- 2 A. Unless otherwise indicated on the drawings or elsewhere in these specifications, all motors shall be
3 furnished by others.
- 4 B. Motors shall be set in place by others and the associated motor starters and controllers shall be turned
5 over to this Contractor for erection and line voltage power wiring.
- 6 C. Any contractor supplying starters and controllers that are not part of this contract shall index same and
7 provide this Contractor with instructions as to proper location in sufficient time to permit the
8 installation of a concealed raceway system.
- 9 D. Where this Contractor is required to provide control wiring, the Contractor supplying the controllers
10 shall provide all necessary and required wiring diagrams for proper installation.
- 11 E. Low voltage (less than 115 volts) control wiring shall be by others, unless noted elsewhere in the
12 specifications except that this Contractor shall extend circuit to associated transformers, wire and
13 connect to same.
- 14 F. This Contractor shall examine the plans and specifications of other sections and shall include in his
15 bid all control wiring, as referenced to be performed by Section 16001.
- 16 G. Required disconnect switches furnished by other sections shall be installed by Section 16001.
17 Furthermore, this Contractor shall provide all disconnect switches required by code that are not
18 furnished by other sections.

19 1.29 SPECIAL OUTLETS

- 20 A. General: Furnish and install outlets, wiring and receptacles accordingly, at locations required by
21 equipment serviced or otherwise as directed. Extend wiring to outlets on equipment and make final
22 connection.

23 1.30 IDENTIFICATION

- 24 A. General:
 - 25 1. Materials and equipment installed under this Section shall be clearly identified as listed below.
 - 26 2. Locate identification conspicuously.
 - 27 3. Terminology to be approved by Architect.
 - 28 4. See plans for any additional items to be identified.
 - 29 5. Loads such as motors shall be described by function rather than by the system of arbitrary
30 number as shown on electrical plans.
 - 31 6. Use abbreviations sparingly.
- 32 B. Laminated Bakelite Plates: Engraved plastic nameplate shall be securely screwed or riveted to the
33 following equipment. Size 1" x 4" with 3/8" high letters; unless space available dictates differently.
 - 34 1. Each panelboard, contactor, time switch, starter or disconnect switch. Locate on inside cover
35 of panels.
 - 36 2. Each feeder at all accessible locations.
 - 37 3. Each end of empty conduit runs to indicate the intended use of the conduit and the location of
38 opposite end. Use room numbers that are permanently assigned.
- 39 C. Typewritten Directory: Each panelboard both new and existing shall be provided with a typewritten
40 directory attached to the inside of panel door and covered with clear plastic indicating load served and
41 rooms served by each protective device in the respective panel. Spares and spaces shall be clearly
42 identified for existing panels, trace existing circuits to confirm use.
- 43 D. Switch Station:
 - 44 1. All key switches shall be engraved indicating controlled item.
 - 45 2. All remote switches shall be engraved indicating controlled item.
 - 46

1 E. Conductor Identification:

- 2 1. Identify each conductor at each wiring device, connector or splice point with permanently
3 attached wrap-around adhesive markers as manufactured by Brady Co. or 3M.
4 2. This identification shall include branch circuit number, control circuit, or any other appropriate
5 number or lettering that will expedite future tracing and trouble shooting.

6 1.31 LOCATIONS OF OUTLETS AND WIRING DEVICES

7 A. Outlets:

- 8 1. Locations of outlets and electrical equipment on the drawings are approximate only. Unless
9 otherwise indicated on the drawings or established in the specifications, the exact locations of
10 electrical outlets shall be established in the field by directive from the Architect. Generally,
11 outlets shall be located as required for proper installation of equipment served and otherwise
12 locations shall be established by construction or code requirements and such as to be
13 coordinated with equipment of other trades.
14 2. This Section shall consult with the Architect and refer to all details, sections, elevations and
15 equipment plans and the plans of other trades for exact location.
16 3. The Architect reserves the right to make reasonable changes in the location of outlets,
17 apparatus or equipment up to the time of roughing in. Such changes as directed shall be made
18 by the Contractor without additional compensation.
19 4. Dimensions taken by scale shall not be used to establish rough-in locations.

20 B. Wiring Devices:

- 21 1. The approximate location of wiring devices are indicated on the drawings; the specific location
22 shall be determined in accordance with "Location of Outlets" of these specifications and as
23 follows.
24 2. This Section is referred to equipment plans, equipment shop drawings, elevation drawings and
25 other detail or dimensional drawings, and he shall consult with the Architect before installation
26 of proceeding with any work dependent upon this information.
27 3. Generally, wiring devices shall be located as follows:
28 a. Wall receptacles shall generally be centered 15" above the finished floor and 6" above
29 surface of built-in counters and tables where same abuts wall and 4" above
30 backsplashes if counters are so equipped.
31 b. Special purpose receptacles shall be located as required by equipment served.
32 c. Switches shall be centered 48" above finished floor on latch side of door opening with
33 edge of plate not more than 12" from door frame, except as noted on the drawings.
34 d. In hazardous areas, the location of wiring devices shall be established by Code
35 requirements which shall take precedence over conflicting information on the drawings
36 or included herein.

37 1.32 TELEPHONE SYSTEM

- 38 A. Refer to the electrical specification section 27 10 00 – Telecommunication Distribution System for
39 detailed information on the telephone system.
40 B. Dane County is currently using a VOIP (voice over internet protocol) telephone system so all
41 telephone cabling will be using same cabling used for data.
42 C. Telephone instruments, switching equipment, wiring, terminal blocks, and other accessories shall be
43 furnished and installed by the Owner (Dane County)
44 D. This Contractor shall supply all required conduit, sleeves, and service fittings for the telephone
45 system.
46 E. All conduits shall be complete with fish wire by this Contractor, and all telephone outlets shall be fed
47 by a minimum 1" conduit.

1 F. All telephone boxes shall be two gang boxes with one gang plaster cover.

2 G. Verify all phone locations with the Architect in the field.

3 1.33 SEALING AND FIREPROOFING

4 A. Sealing and fireproofing of openings between conduit, cable tray, wireway, trough, cablebus, busduct,
5 etc. and fire rated surfaces shall be the responsibility of the contractor whose work penetrates the
6 opening.

7 B. Sealing and fireproofing shall use materials and methods complying with ASTM E814 requirements
8 appropriate to the rating of the material penetrated.

9 C. Materials by Dow-Corning, 3M, Specified Technologies, Inc., and Chase-Foam are acceptable if in
10 accordance with (B) above.

11 D. Submit manufacturer's penetration details to authority having jurisdiction. Details shall confirm
12 method's compliance with ASTM E814.

13 E. Include copies of penetration details in Project Operation and Maintenance Manuals.

14 1.34 ALTERNATE BIDS

15 A. See Section 01030 for descriptions of alternates required.

16 END OF SECTION 26 05 00

SECTION 26 09 23

OCCUPANCY SENSOR LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 GENERAL PROVISIONS

- A. In general, the work includes:
 - 1. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.
 - 2. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16.
 - 3. Contractor must submit data sheets on sensors, control units and all junction boxes and mounting accessories, including all wiring diagrams.

1.03 EQUIPMENT QUALIFICATION

- A. Products supplied shall be from a manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years.
- B. All components shall be UL listed, offer a five (5) year warranty and meet all state and local applicable codes requirements.

1.04 SYSTEM DESCRIPTION

- A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.
- C. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The suppliers obligation shall include repair or replacement, and testing without charge to the owner, all or in parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.05 SUBMITTALS

- A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data, and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.
- B. Submit a lighting plan clearly marked by manufacturer showing proper product, location, and orientation of each sensor.
- C. Submit any interconnection diagrams per major sub-system showing proper wiring.
- D. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.

1 1.06 SYSTEM OPERATION

- 2 A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction
3 with the occupancy system.

4 PART 2 - PRODUCTS

5 2.01 ACCEPTABLE MANUFACTURERS

- 6 A. The Watt Stopper, Inc.
7 B. Or Equivalent Devices by the Following Manufacturers
8 1. Hubbell
9 2. Leviton
10 3. Sensor Switch

11 2.02 SYSTEM OPERATION

- 12 A. All products shall be Watt Stopper product numbers:
13 1. Ceiling Sensors: W-500A, W-1000A, W-2000A, W-2000H, W-PIR, DT-100L, CI-100, CI-
14 200.
15 2. Wall Sensors: WI-120A, WI-277A, WS-120, WS-277, WM-120, WM-277.
16 3. Power and Slave Packs: A-120E, A-277E, S-120/277.
17 4. Low Temperature: CB-100, CB-200.
18 B. Wall switch sensors shall be capable of detection of motion at desk top level up to 300 square feet,
19 and gross motion up to 1,000 square feet.
20 C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts at 277
21 volts, and shall have 180 degree coverage capability.
22 D. Bi-level wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000
23 watts to 277 volts.
24 E. Passive Infrared sensors shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier
25 configuration, with grooves-in to eliminate dust and residue build-up.
26 F. Passive Infrared and Dual Technology sensors shall have fully automatic operation, offer daylighting
27 footcandle adjustment control and be able to accommodate dual level lighting.
28 G. All sensors shall be capable of operating normally with electronic ballast, PL lamp systems, and rated
29 motor loads.
30 H. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic
31 reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
32 I. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity.
33 Controls shall be recessed to limit tampering.
34 J. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is
35 utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is
36 replaced. This control shall be recessed to prevent tampering.
37 K. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005% tolerance
38 to assure reliable performance and eliminate sensor cross talk. Sensors using multiple frequencies are
39 not acceptable.
40 L. All sensors shall provide a method of indication to verify that motion is being detected during testing
41 and that the unit is working.
42

- 1 M. Where specified, sensor shall have an internal additional isolated relay with Normally Open,
2 Normally Closed, and Common outputs for use with HVAC control, Data Logging, and other control
3 options. Sensors utilizing separate components to achieve this function are not acceptable.
- 4 N. All sensors shall have no leakage current to load in manual or in Auto/Off mode for safety purposes
5 and shall have voltage drop protection.
- 6 O. The Contractor shall certify in writing that installed sensors comply with the specified California
7 Energy Commission criteria for ultrasonic sound.
- 8 P. All sensors shall have UL rated, 94V-0 plastic enclosures.

9 2.03 CIRCUIT CONTROL HARDWARE - CU

- 10 A. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to
11 mount on external J boxes and be integrated self-contained unit consisting internally of load switching
12 control relay and a transformer to provide low-voltage power to a minimum of two (2) sensors.
- 13 B. Relay Contacts shall have ratings of:
 - 14 1. 13A - 120 VAC Tungsten
 - 15 2. 20A - 120 VAC Ballast
 - 16 3. 20A - 277 VAC Ballast

17 2.04 CONTROL WIRING

- 18 A. Control wiring between sensors and controls units shall be Class II, 18-24 AWG stranded U.L.
19 Classified, PVC insulated or Teflon jacketed cable approved for use in plenums, where applicable.

20 PART 3 - EXECUTION

21 3.01 INSTALLATION

- 22 A. It shall be the contractor's responsibility with the suppliers assistance to locate and aim sensory in the
23 correct location required for complete and proper volumetric coverage within the range of coverage(s)
24 of controlled areas. Rooms shall have ninety (90) to one hundred (100) percent coverage to
25 completely cover the controlled area to accommodate all occupancy habits of single or multiple
26 occupants at any location within in the room(s). The locations and quantities of sensors shown on the
27 drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The
28 contractor shall provide additional sensors if required to properly and completely cover the respective
29 room.
- 30 B. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's
31 factory authorized representative, at the owner's facility, to verify placement of sensors and
32 installation criteria.
- 33 C. Proper judgement must be exercised in executing the installation in the available space and to
34 overcome local difficulties due to space limitations or interference of structural components. The
35 contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's
36 personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy
37 sensing devices and systems, or;

38 END OF SECTION 26 09 23

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SECTION 26 20 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 REFERENCES

- A. National Electrical Manufacturer's Association (NEMA).
- B. Underwriters Laboratories, Inc. (UL).
- C. American Society for Testing and Materials (ASTM).
- D. National Fire Protection Association (NFPA).

1.03 SUBMITTALS

- A. Product Data
 - 1. Submit for disconnects, motor starters, panelboards, circuit breakers, overcurrent protective devices, transformers, and mini-power centers.
 - 2. Product data sheets with printed installation instructions.
- B. Shop Drawings:
 - 1. Submit for motor starters.
 - 2. Show enclosure dimensions, nameplate nomenclature, electrical ratings, and thermal unit schedule.
 - 3. Wiring diagrams and schematics.
- C. Approval of equipment supplied in this section is contingent upon Contractor verification of available fault current from electric utility.
 - 1. Notify ENGINEER if available fault current is higher than specified equipment.
- D. Submit in accordance with Section 01340.
- E. Operation and Maintenance (O&M) Data:
 - 1. Maintenance data for materials and products for inclusion in Operating and Maintenance specified in Section 01730.
 - 2. Submit in accordance with Section 01340 and 01730.
- F. Test Results:
 - 1. Report of field tests and observations certified by Contractor.

1.04 QUALITY ASSURANCE

- A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).
 - 1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
 - 2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.
- B. Regulatory Requirements:
 - 1. National Electrical Code: Components and installation shall comply with NFPA 70.
 - 2. Local codes and ordinances.

1 PART 2 - PRODUCTS

2 2.01 ELECTRICAL METALLIC TUBING (EMT)
3 INTERMEDIATE METALLIC CONDUIT (IMC)
4 GALVANIZED RIGID STEEL CONDUITS (GRS)

5 A. Manufacturers:

- 6 1. Allied Steel
- 7 2. Omega
- 8 3. Wheatland
- 9 4. Columbia

10 B. Manufacturer's standard lengths and size.

11 C. Protected inside and out by hot-dipped galvanized or electrogalvanized coating.

12 D. Minimum size: 1/2 inch.

13 E. Do not use aluminum conduit.

14 2.02 PLASTIC CONDUIT (PVC)

15 A. Manufacturers:

- 16 1. Carlon.
- 17 2. Genova.
- 18 3. Certainteed.

19 B. Standard lengths and sizes.

20 C. Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC2 standards,
21 UL listed, and as required by NEC.

22 D. Rated for 90 degrees C cable.

23 E. Minimum size: 2" inches.

24 2.03 FLEXIBLE CONDUIT

25 A. Manufacturers:

- 26 1. Triangle PWC, Inc.
- 27 2. Anaconda
- 28 3. Flexsteel
- 29 4. American Flexible Conduit

30 B. Galvanized flexible steel.

31 C. Standard conduit sizes.

32 D. Minimum Size: 1/2 inch.

33 2.04 LIQUIDTIGHT FLEXIBLE CONDUIT

34 A. Manufacturers:

- 35 1. O-Z/Gedney Company
- 36 2. American Flexible Conduit
- 37 3. Flex-Guard, Inc.
- 38 4. Liquatite
- 39 5. Anaconda

40 B. Galvanized flexible steel.

- 1 C. Standard conduit sizes.
- 2 D. Minimum Size: 1/2 inch.
- 3 E. Heavy wall PVC jacket.
- 4 2.05 FITTINGS
- 5 A. Manufacturers:
 - 6 1. Appleton Electric Company.
 - 7 2. Steel City, American Electric.
 - 8 3. Oz-Gedney Co.
- 9 B. Steel or malleable iron, zinc galvanized or cadmium plated.
- 10 C. Do not use indentor type fittings. Set screw fittings are acceptable.
- 11 D. Do not use aluminum or die cast fitting.
- 12 E. EMT IMC and GRS Connectors and Couplings:
 - 13 1. Threaded.
 - 14 2. Insulated throat.
 - 15 3. Rain and concrete type.
- 16 F. Flexible Conduit Connectors and Couplings:
 - 17 1. Threaded.
 - 18 2. Insulated throat.
 - 19 3. Grounding type.
- 20 G. Liquidtight Flexible Conduit Fittings:
 - 21 1. Liquidtight.
 - 22 2. Insulated throat.
 - 23 3. Threaded.
 - 24 4. Grounding type.
- 25 H. Expansion Joints:
 - 26 1. Conduit expansion fittings complete with copper bonding jumper, Crouse-Hinds Type XJ.
 - 27 2. Conduit expansion/deflection fittings with copper bonding jumper, Crouse-Hinds Type XD.
- 28 I. Seals:
 - 29 1. Wall entrance, Appleton Type FSK or FSC.
- 30 J. Drain Fittings:
 - 31 1. Automatic Drain Breather:
 - 32 a. Explosionproof.
 - 33 i. Safe for Class I, Groups C and D.
 - 34 b. Capable of passing minimum 25 cc water/minimum and minimum 0.05 cubic foot
 - 35 air/minimum at atmospheric pressure.
 - 36 2. Condensate Drain:
 - 37 a. Conduit outlet body, Type T.
 - 38 b. Threaded, galvanized plug with 3/16 inch drilled holed through plug.
- 39 2.06 WIRES, CABLES, AND CONNECTORS
- 40 A. Manufacturers:
 - 41 1. Wire and Cable:
 - 42 a. Continental

- 1 b. Southwire.
- 2 c. Rome Cable.
- 3 d. Houston Wire and Cable.
- 4 e. Beldon.
- 5 f. Dekoron.
- 6 g. Royal
- 7 h. South
- 8 i. General
- 9 2. Connectors:
- 10 a. Burndy.
- 11 b. Thomas and Betts.
- 12 c. Blackburn, American Electric.
- 13 3. Electrical Tape:
- 14 a. 3M Scotch Brand.
- 15 b. Plymouth.
- 16 c. or equal.
- 17 B. Copper wire only.
- 18 C. 600 v insulation (ASTM standard compounds) and color code conductors for low voltage (secondary
- 19 feeders and branch circuits) as required by NEC.
- 20 1. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for branch circuit and
- 21 feeder conductors size No. 8 AWG and smaller.
- 22 2. Type XHHW-2 Stranded: Single conductor for branch circuits, feeders and service conductors
- 23 larger than No. 8 AWG.
- 24 3. Provide grounding conductor with same insulation as circuit conductors when run with circuit
- 25 conductors.
- 26 4. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for 120 v control wiring
- 27 and No. 14 AWG minimum for graphic indication, nonshielded instrumentation and other
- 28 control wiring operating at less than 120 v unless otherwise noted on Drawings.
- 29 a. Provide high density polyethylene jacketed multi-wire cable assemblies in underground
- 30 conduit or duct.
- 31 D. Joints, Taps, and Splices:
- 32 1. Joints, Taps, and Splices in Conductors No. 10 AWG and Smaller: UL listed compression
- 33 spring-type solderless connectors with plastic cover.
- 34 2. Joints, Taps, and Splices in Conductors No. 8 AWG and Larger: Solderless two or four-bolt
- 35 compression type connectors of type that will not loosen under vibration or normal strains.
- 36 3. Terminations: Compression-type crimp lugs.

37 2.07 BOXES

- 38 A. Manufacturer:
- 39 1. Interior Outlet Boxes:
- 40 a. Appleton Electric Company.
- 41 b. Raco.
- 42 c. Steel City, American Electric.
- 43 2. Weatherproof Outlet Boxes:
- 44 a. Appleton Electric Company.
- 45 b. Crouse-Hinds Company.
- 46

- 1 c. O-Z/Gedney company.
- 2 d. Perfect-Line, American Electric.
- 3 3. Junction and Pull Boxes:
- 4 a. Hoffman Engineering Company.
- 5 b. Keystone Columbia, Inc.
- 6 c. Electromate.
- 7 B. Outlet Boxes - Flush Mounted:
- 8 1. Wall Outlets: Square corner, galvanized masonry type with internally mounted ears or 4-
- 9 inches square with raised cover having square corners and internally mounted ears.
- 10 2. Ceiling Lighting Fixture Outlet Boxes: 4-inch square galvanized box with raised cover set
- 11 flush with finished surface, complete with 3/8 inch fixture stud.
- 12 C. Outlet Boxes - Surface Mounted:
- 13 1. General Use: 4-inches square with raised device cover.
- 14 2. Weatherproof: Cast galvanized with threaded hub.
- 15 3. Safety outlet enclosure - Tay Mac Co. - Verify outlet configuration.
- 16 4. Hazardous Locations: Cast galvanized approved for classification of area.
- 17 D. Junction and Pull Boxes:
- 18 1. Fabricate from code gauge galvanized steel, with covers held in-place by corrosion resistant
- 19 machine screws.
- 20 2. Size as required by code for number of conduits and conductors entering and leaving box.
- 21 3. Provide with welded seams where applicable, and equipment with corrosion resistant nuts,
- 22 bolts, screws, and washers.
- 23 4. Finish with rust inhibiting primer.
- 24 2.08 FIRE RATED THROUGH FLOOR FITTINGS
- 25 A. None required.
- 26 2.09 WIRING DEVICES
- 27 A. Manufacturers:
- 28 1. Hubbell Wiring Device Division.
- 29 2. Pass and Seymour, Inc.
- 30 3. Leviton
- 31 4. Cooper Wiring Devices
- 32 B. Fabricated Devices:
- 33 1. Factory-fabricated, specification grade wiring devices in type, color, and electrical rating for
- 34 service indicated. Ivory color or as selected by ENGINEER OR OWNER.
- 35 2. Wiring devices of one manufacturer.
- 36 3. See Drawing symbol schedule for identification of device type.
- 37 C. Switches:
- 38 1. General Use Lighting Switches: 20 amp toggle, equal to Hubbell No. 1221-I series.
- 39 2. Switches controlling equipment, operation of which is not evident from switch position, shall
- 40 include flush neon pilot light in conjunction with proper switch. Each switch shall be complete
- 41 with engraved plate to identify equipment being controlled (white letters on black, 1/8 inch
- 42 high minimum).
- 43

- 1 D. Receptacles:
- 2 1. General use duplex receptacles: NEMA No. 5-20R, grounding type, 20 amp Hubbell No. 5362
- 3 Specification Grade.
- 4 2. Special purpose receptacles as shown on Drawings and schedules.
- 5 3. GFI receptacles shall be Hubbell GFR5352IA
- 6 E. Wiring Device Plates and Covers:
- 7 1. Wall plates for wiring devices with ganging and cut-outs as indicated, provided with metal
- 8 screws for securing plates to devices, screw heads colored to match finish of plate.
- 9 2. Plates for Flush Mounted Devices: Equal to Sierra P line specifications grade Type No. 430
- 10 brushed stainless steel.
- 11 3. Telephone outlet configuration to match telephone outlet jack or cable.
- 12 4. Device plates for surface mounted Type FS or FD boxes to be Type FSK galvanized steel.
- 13 5. Device plates for surface mounted, 4-inch square bossed to be ½ inch raised galvanized steel
- 14 covers.
- 15 6. Weatherproof outlet enclosure for exterior devices or devices in damp locations to be marked
- 16 galvanized gray cast malleable with gasketed lift cover plate as shown on Drawings. Suitable
- 17 for wet locations while in use. Enclosure must be gasketed. Provide Intermatic WP1010MC,
- 18 WP1010HMC, or WP1030MC with appropriate mounting base(s) and inserts.

19 2.10 MOTOR STARTERS

- 20 A. None required.

21 2.11 MOTOR AND CIRCUIT DISCONNECTS

22 A. Manufacturers:

- 23 1. Eaton/Cutler-Hammer
- 24 2. Square D
- 25 3. General Electric

26 B. Enclosed Circuit Breaker Construction:

- 27 1. Dual cover interlock.
- 28 2. External trip indication.
- 29 3. Provisions for control circuit interlock.
- 30 4. Padlock provisions for padlock in Off position.
- 31 5. Handle attached to box, not cover.
- 32 6. Handle position indicates On, Off or Tripped.
- 33 7. Provisions for insulated or groundable neutral.

34 C. Safety Switches:

- 35 1. NEMA heavy duty Type HD.
- 36 2. Dual cover interlock.
- 37 3. Visible blades.
- 38 4. Provisions for control circuit interlock.
- 39 5. Pin type hinges.
- 40 6. Tin plated current carrying parts.
- 41 7. Quick make and break operator mechanism.
- 42 8. Handle attached to box, not cover.
- 43 9. Handle position indication, On in up position and Off in down position.
- 44 10. Padlock provisions for up to 3 padlocks in Off position.

- 1 11. UL listed lugs for type and size of wire specified.
- 2 12. Spring reinforced fuse clips for Class R fuses.
- 3 13. Provisions for insulated or groundable neutral.
- 4 14. UL listed short circuit rating 200,000 RMS amp with Class R fuses.
- 5 D. Enclosures:
- 6 1. Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.
- 7 2. Outdoor: NEMA 3R code gauge zinc coated steel with baked enamel finish.
- 8 2.12 FUSES
- 9 A. Manufacturers:
- 10 1. Bussmann
- 11 2. Gould Shawmut
- 12 3. Littlefuse
- 13 4. Brush
- 14 B. 250 v. Fuses:
- 15 1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp
- 16 interrupting rating.
- 17 a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit protection
- 18 for motor, transformer, welder, feeder, and main service protection.
- 19 C. 600v Fuses:
- 20 1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp
- 21 interrupting rating.
- 22 a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit protection
- 23 for motor, transformer, welder, feeder and main service protection.
- 24 2. Class L, bolt-in 601 to 6,000 amps, 200,000-amp interrupting rating.
- 25 a. Gould Shawmut A48Y, time delay for overload and short circuit protection for motor,
- 26 transformer, feeder, and main service protection.
- 27 3. Class CC, fast acting, single element, 1/10 to 30 amps, 200,000-amp interrupting rating.
- 28 a. Gould Shawmut ATDR, UL listed for motor control circuits, lighting ballasts, control
- 29 transformers, and street lighting fixtures.
- 30 D. Spare Fuses:
- 31 1. 10%, minimum of 3, of each type and rating of installed fuses.
- 32 E. Spare Fuse Cabinet:
- 33 1. Cabinet: Wall-mounted, 18-gauge minimum steel unit with full-length, recessed piano-hinged
- 34 door with key coded cam lock and pull.
- 35 2. Size: Provide for orderly storage of spare fuses of this project plus 15% spare capacity,
- 36 minimum.
- 37 3. Finish: Gray baked enamel.
- 38 4. Cabinet Door: Bear legend in stencilled 1-1/2 inch high letters, "Spare Fuses."

39 2.13 PANELBOARDS

- 40 A. Panelboards are existing.

41 2.14 MOLDED CASE CIRCUIT BREAKERS

- 42 A. Manufacturers:
- 43 1. Eaton to match existing panels.

1 2.15 GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLES (GFCI)

2 A. Ratings:

- 3 1. 120 vac.
4 2. 20 amp.

5 B. Tripping Requirement:

- 6 1. UL Class A.

7 C. Construction:

- 8 1. Shallow depth.
9 2. Line and load terminal screws.
10 3. Noise suppression.
11 4. Feed through.
12 5. Standard duplex wall plates shall fit.
13 6. NEMA 5-20R configuration.

14 D. Meet requirements of UL 943 ground-fault circuit interrupters.

15 2.16 GROUNDING AND BONDING

16 A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes,
17 ratings, and quantities indicated are in excess of NEC requirements, more stringent requirements and
18 greater size, rating, and quantity indications govern.

19 B. Conductor Materials: Copper.

20 C. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including
21 stranding.

22 D. Equipment Grounding Conductor: Green insulated.

23 E. Grounding Electrode Conductor: Stranded cable.

24 F. Bare Copper Conductors:

- 25 1. Solid Conductors: ASTM B3.
26 2. Assembly of Stranded Conductors: ASTM B8.
27 3. Tinned Conductors: ASTM B33.

28 G. Ground Bus: Bar annealed copper bars of rectangular cross section.

29 H. Braided Bonding Jumpers: Copper tape, braided No. 30 gage bar copper wire, terminated with copper
30 ferules.

31 I. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inches thick and 2 inches wide, except as
32 indicated.

33 J. Connector Products

- 34 1. General: Listed and labeled as grounding connectors for materials used.
35 2. Pressure Connectors: High-conductivity-plated units.
36 3. Bolted Clamps: Heavy-duty units listed for application.
37 4. Exothermic Welded Connections: Provide in kit form and select for specific types, sizes, and
38 combinations of conductors and other items to be connected.

39 PART 3 - EXECUTION

40 3.01 GENERAL

41 A. Install products in accordance with NEC, manufacturer's instructions, applicable standards, and
42 recognized industry practices to ensure products serve intended function.

- 1 3.02 CONDUITS AND CONDUIT FITTINGS
- 2 A. Complete conduit installation prior to installing cables.
- 3 B. Unless specifically indicated otherwise on Drawings, use rigid galvanized steel conduit for general
4 wiring.
- 5 C. Provide watertight conduit system where installed in wet places, underground or where buried in
6 masonry or concrete.
- 7 D. EMT conduit may be used for conduit sizes up to 4 inches.
- 8 E. Conduit shall be run concealed except exposed surface conduit may be installed where noted on
9 Drawings or where concealment found to be impractical or impossible, and only with approval of
10 ENGINEER.
- 11 F. Continuous from outlet to outlet and from outlets to cabinets, junction or pull boxes.
- 12 G. Enter and secure to boxes ensuring electrical continuity from point of service to outlets.
- 13 H. Conduit runs extending through areas of different temperature or atmospheric conditions or partly
14 indoors and partly outdoors shall be sealed, drained, and installed in manner preventing drainage of
15 condensed or entrapped moisture into cabinets, motors or equipment enclosures.
- 16 I. Run conduits within concrete structures parallel to each other and spaced on center of at least three
17 times conduit trade diameter with minimum 2-inch concrete covering. Conduits over 1 inch may not
18 be installed in slab without approval of ENGINEER.
- 19 J. Run exposed conduits parallel to or at right angles with lines of building.
- 20 K. Route conduit runs above suspended acoustical ceilings not interfering with tile panel removals.
- 21 L. Secure conduit in-place with not less than 1 malleable corrosionproof alloy strap or hanger per 8 feet
22 of conduit.
- 23 1. Do not use perforated strapping.
- 24 M. Connections to Motors and Equipment Subject to Vibration:
- 25 1. Flexible steel conduit not over 3 feet long or where exposed in mechanical and utility areas and
26 not subjected to moisture, dirt, and fumes.
- 27 2. Liquidtight flexible conduit not over 3 feet long where exposed in finished areas or where
28 subject to moisture, dirt, fumes, oil, corrosive atmosphere, exposed or concealed, with
29 connectors to ensure liquidtight, permanently grounded connection. Locate where least subject
30 to physical abuse.
- 31 N. Use double lock nuts and insulated bushings with threads fully engaged.
- 32 O. Connectors at fixture bodies and boxes shall be rigidly secured with galvanized lock nut and bushing.
- 33 P. Cap conduits after installation to prevent entry of debris.
- 34 Q. Install conduit expansion fittings complete with bonding jumper in following locations.
- 35 1. Conduit runs crossing structural expansion joint.
- 36 2. Conduit runs attached to two separate structures.
- 37 3. Conduit runs where movement perpendicular to axis of conduit may be encountered.
- 38 R. Install 4 feet-0 inch to 6 feet-0 inch flexible steel conduit drops from independent junction box
39 mounted above ceiling and accessible from below ceiling to recessed ceiling mounted equipment.
40 Allow for positioning of equipment to tile increments.
- 41 S. Negotiate beams and changes in ceiling heights with LB conduit fittings on outside corners and ells
42 on inside corners. Arrange bends and offsets in parallel conduits to present neat symmetrical
43 appearance.
- 44 T. In precast areas, run conduits in insulation space or in floor topping without crossing conduits, using
45 3/4 in. maximum conduit size.

- 1 U. Core drill through reinforced concrete with approval of ENGINEER.
- 2 V. Split, crushed or scarred conduit not acceptable.
- 3 W. Do not route over boiler, incinerator or other high temperature equipment.
- 4 X. Flexible metal conduit can only be used for final connections to motors, transformers, or to light
- 5 fixtures above suspended ceilings.

6 3.03 SURFACE METAL RACEWAY

- 7 A. Mount to surface with No. 8 flathead fasteners or approved support clips.
- 8 B. Do not pinch wires.
- 9 C. Remove metal burrs and sharp edges.
- 10 D. Provide bushing.
- 11 E. Install in accordance with manufacturer's recommendations.
- 12 F. Provide covers where two lengths come together.

13 3.04 WIRE AND CABLE

- 14 A. Run wire and cable in conduit unless otherwise indicated on Drawings.
- 15 B. On branch circuits, use standard colors.
- 16 C. Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with 2 half-lap layers of
- 17 vinyl plastic electrical tape and finish wrap of color coding tape, where required by code.
- 18 D. Run ground wire with power circuits; conduit shall not be grounding path.
- 19 E. Color Coding: Conductors for lighting and power wiring as indicated below.

20	<u>Phase</u>	<u>208/120v</u>	<u>480/277v</u>
21	A	Black	Brown
22	B	Red	Orange
23	C	Blue	Yellow
24	Neutral	White	Gray
25	Ground	Green	Green

26 3.05 BOXES

- 27 A. Install knockout closures to cap unused knockout holes where blanks have been removed.
- 28 B. Locate boxes to ensure accessibility of electrical wiring.
- 29 C. Secure boxes rigidly to subsurface upon which being mounted or solidly embed boxes in concrete or
- 30 masonry. Do not support from conduit.
- 31 D. Do not burn holes, use knockout punches or saw.
- 32 E. Provide outlet box accessories as required for each installation such as mounting brackets, fixture
- 33 study, cable clamps, and metal straps for supporting outlet boxes compatible with outlet boxes being
- 34 used and meeting requirements of individual wiring situations.
- 35 F. Location of outlets and equipment shown on Drawings is approximate. Verify exact location.
- 36 G. Minor modification in location of outlets and equipment is considered incidental up to distance of 10
- 37 feet with no additional compensation, provided notification of modification is given prior to roughing
- 38 in of outlet.
- 39 H. Flush outlets shall have edges or plaster flush with finished wall or ceiling surfaces so plates can be
- 40 drawn tightly to wall or ceiling surfaces.
- 41 I. Mounting heights:
- 42 1. Shall conform to ADA guidelines.

- 1 2. In general, unless otherwise shown on Drawings:
- 2 a. Switches: 48 inches above floor to top of box.
- 3 b. AC Receptacles and Telephone Outlets: 15 inches above floor to bottom of box or 6
- 4 inches above counters, counter backslashes in finished areas; 48 inches to top of box
- 5 above floor in unfinished areas.
- 6 c. Wall Bracket Lighting Fixtures: 8 inches above mirrors or 6 feet-6 inches above floor.
- 7 d. Pushbuttons: 48 inches above floor to top of box.
- 8 e. Motor Starters and Disconnect Switches: 60 inches above floor.
- 9 i. Thermostats: 48 inches above floor.
- 10 f. Bells and Horns: 8 feet-0 inches above floor.
- 11 g. Clocks: 8 ft.-0 inches above floor.
- 12 h. Fire Alarm visual signals 80" above floor.
- 13 i. Emergency Battery Units: 8 ft. - 0 inches above floor or 12" below ceiling.
- 14 J. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall,
- 15 minimum 12 inches.
- 16 K. Where emergency switches occur adjacent to normal light switches, install in separate boxes in
- 17 accordance with NEC and device plate color coding separation.
- 18 L. Light Fixture Outlet Boxes:
- 19 1. Securely mount with approved type bar hangers spanning structural members to support
- 20 weight of fixture.
- 21 2. Do not support from conduit.
- 22 3. Equip with 3/8-inches fixture stud and tapped fixture ears.
- 23 3.06 FIRE RATED THROUGH FLOOR FITTINGS
- 24 A. None required.
- 25 3.07 WIRING DEVICES
- 26 A. Do not install devices until wiring is complete.
- 27 B. Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or
- 28 otherwise. Make circuit connections by using wire connectors and pigtails.
- 29 C. Install gasket plates for devices or system components having light emitting features such as switch
- 30 with pilot light and dome lights. Where installed on rough textured surfaces, seal with black self-
- 31 adhesive polyfoam.
- 32 D. Ground receptacles with insulated green ground wire from device ground screw to bolted outlet box
- 33 connection or as shown on Drawings.
- 34 E. Wrap wiring devices with insulating tape.
- 35 F. Install emergency switches which occur adjacent to normal light switches in separate boxes to
- 36 maintain systems isolation in accordance with NEC.
- 37 3.08 OVERCURRENT PROTECTIVE DEVICES.
- 38 A. Install fuses just prior to energizing equipment.
- 39 B. Locate circuit breakers as shown on Drawings.
- 40 C. Install GFCI receptacles as required by NEC.
- 41 3.09 PANELBOARDS
- 42 A. Flush or surface mount as specified on Drawings and schedules.

- 1 B. Support panel cabinets independently to structure with no weight bearing on conduits.
- 2 C. Install recessed Panelboards to allow cover to be drawn tight against wall to provide neat appearance.
- 3 D. Install panelboards so top breaker is not higher than 6 feet-0 inches above floor.
- 4 E. Adjacent panel cabinets shall be same size and mounted in horizontal alignment.
- 5 F. Install typewritten directory in each panelboard, accurately indicating rooms or equipment being
- 6 served after final circuit changes have been made to balance circuit loads.
- 7 G. Install four spare 1 inch conduits from top of each flush mounted panelboard to area above ceiling for
- 8 future use. On flush mounted panelboards located on first and higher level floors, provide two spare 1
- 9 inch conduits from bottom of panelboard to ceiling area of floor below for future use.

10 3.10 GROUNDING AND BONDING

- 11 A. Application
 - 12 1. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and
 - 13 quantities of equipment grounding conductors, except where larger sizes or more conductors
 - 14 are indicated.
 - 15 a. Install separate insulated equipment grounding conductors with circuit conductors.
 - 16 Raceway may be used as equipment ground conductor where feasible in non-hazardous
 - 17 areas and permitted by NEC for lighting circuits. Install insulated equipment ground
 - 18 conductor in nonmetallic raceways unless designated for telephone or data cables.
- 19 B. Installation
 - 20 1. General: Ground electrical systems and equipment in accordance with NEC requirements
 - 21 except where Drawings or Specifications exceed NEC requirements.

22 3.11 FIELD QUALITY CONTROL

- 23 A. Control Circuits, Branch Circuits, Feeders, Motor Circuits, and transformers:
 - 24 1. Megger check to phase-to-phase and phase-to-ground insulation levels.
 - 25 a. Do not megger check solid state equipment.
 - 26 2. Continuity.
 - 27 3. Short circuit.
 - 28 4. Operational check.
- 29 B. Wiring Devices:
 - 30 1. Test receptacles with Hubbell 5200, Woodhead 1750 or equal tester for correct polarity, proper
 - 31 ground connection, and wiring faults.

32 3.12 ADJUSTMENT AND CLEANING

- 33 A. Circuit Breakers:
 - 34 1. Adjustable settings shall be set to provide selective coordination, proper operation, and
 - 35 compliance with NEC.
- 36 B. Restore damaged areas on PVC jacketed rigid conduit with spray type touch-up coating compound or
- 37 as directed by manufacturer.
- 38 C. Pull cleaning plug through conduits to clear of dirt, oil, and moisture.

39 END OF SECTION 26 20 00

SECTION 26 31 10
PHOTOVOLTAIC GENERATING SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Section Includes: Fully operational, photovoltaic, grid-tie, electric generating system.
- B. Related Sections:
1. Section 26 31 11 – Mounting Structure for Solar Modules.
 2. Section 26 31 12 – Photovoltaic Panels

1.03 DEFINITIONS

- A. Array: A mechanically-integrated assembly of modules and panels, together with support structure and foundation, tracking, thermal control, and other components, if used, to form a DC power-producing unit.
- B. Azimuth angle: For a surface such as a sloped roof, project a line that extends perpendicular from the roof onto a horizontal plane. The angular deviation of this projection from the local meridian (north-south line) constitutes the surface azimuth angle. Due south is zero azimuth, west of south is assigned as positive, and east of south is assigned as negative.
- C. Insolation: Sunlight, direct and/or diffuse (not to be confused with insulation). The integrated intensity of sunlight reaching a given area, usually expressed in watts per square meter per day. This measurement may be used to express the average amount of solar energy falling on different regions of the country. I
- D. Magnetic declination: The difference between true north (the axis around which the earth rotates) and magnetic north (the direction the needle of a compass will point).
- E. Module: A number of solar cells connected together electrically and sealed inside a weatherproof package with a clear face. Sometimes called a "solar panel".
- F. Panel: A designation for a number of PV modules assembled in a single mechanical frame.
- G. Photovoltaic: Pertaining to the direct conversion of light into electricity.
- H. PTC (PVUSA Test Conditions): Test conditions applied to PV modules intended to represent wattage during operation. Irradiance of 1000 W/m², 68 degrees F (20 degrees C) ambient temperature, 1 meter/second wind speed, and an air mass of 1.5.
- I. String: A number of modules or panels interconnected electrically in series to produce the operating voltage required by the load.
- J. STC (Standard Test Conditions): Test conditions applied to PV modules. Irradiance of 1000 W/m², cell temperature of 25 degrees C and an air mass of 1.5.
- K. Tilt Angle: The angle of inclination of a solar panel measured from the horizontal plane.
- L. Utility-Interactive Inverter: An inverter that can function only when electrically connected to the utility grid, and uses the prevailing line-voltage frequency on the utility line as a control parameter to ensure that the photovoltaic array's DC output is converted to AC power and fully synchronized with the utility power.

1 1.04 SYSTEM DESCRIPTION

2 A. Design Requirements:

- 3 1. Contractor is responsible for providing the PV system, including attachment to structural
- 4 system and necessary modifications to meet specified requirements and maintain visual design
- 5 concepts.
- 6 2. Contract Drawings are diagrammatic and are intended to establish basic dimension of units,
- 7 sight lines, and profiles of units.
- 8 3. Provide details for attachment, fastening, penetrations, and electrical connections.
- 9 4. Provide concealed fastening wherever possible.
- 10 5. Provide weather-tight penetrations of building envelope for structural and electrical
- 11 connections.
- 12 6. Attachment considerations shall take into account site peculiarities and expansion and
- 13 contraction movements so there is no possibility of loosening, weakening, or fracturing
- 14 connection between PV system and building envelope components.
- 15 7. Do not penetrate the roof system.

16 B. Interface with building systems

- 17 1. PV system AC connection point 120/208V-wye, 3-phase, 4-wire.
- 18 2. Data transmission means RS232 or RS485.

19 C. Financial Incentives, Rebates, and Tax Credit Eligibility Requirements for PV systems:

- 20 1. Identify potential incentives, rebates, and tax incentives.
- 21 2. Provide PV System including design and installation that complies with eligibility
- 22 requirements for PV system owner to receive incentives, rebates, and tax credits from sources
- 23 such as federal, state, and electric utility services providers.

24 D. Contact Laura McFadden at Madison Gas and Electric (608-252-5654). Meet and review all

25 interconnection requirements prior to any work, including preparation of shop drawings.

26 E. Complete application for interconnection (PSCW 6028).

27 F. Assist owner in completing Interconnection Agreement (PSCW 6030).

28 1.05 SUBMITTALS

29 A. General: Submit in accordance with Section 01 00 00.

30 B. Product Data:

- 31 1. Submit product data for photovoltaic system components.
- 32 2. Include information for factory finishes, hardware, glass treatment, sealants, grounding,
- 33 accessories, and other required components.

34 C. Shop Drawings:

- 35 1. Submit shop drawings covering fabrication, installation, and finish of specified systems.
- 36 2. Fully dimensioned plans and elevations with detail coordination keys.
- 37 3. Electrical and structural penetration details of weather-tight building envelope.
- 38 4. Locations and types of exposed fasteners and joints.
- 39 5. Wiring diagrams
- 40 6. Rough-in requirements

41 D. Samples:

- 42 1. None Required.

- 1 E. Submit the following Informational Submittals:
 - 2 1. Test Reports: Written results obtained from manufacturer or independent third party
 - 3 certification of testing specified as part of System Requirements and Source and Field Quality
 - 4 Control articles.
 - 5 2. Certifications specified in Quality Assurance article.
 - 6 3. Qualification Data:
 - 7 a. Contractor's and manufacturer's qualifications verifying minimum 5 years of
 - 8 commercial experience.
 - 9 b. Include list of 5 completed projects having similar scope of Work identified by name,
 - 10 location, date, reference names, and phone numbers.
 - 11 4. Manufacturer's Instructions:
 - 12 a. Manufacturer's printed installation instructions.
 - 13 b. Indicate by transmittal that copies of instructions and recommendations have been
 - 14 distributed to installer.
 - 15 c. Contractor's Field Reports: Written results and findings of Contractor's field services
 - 16 specified as part of Field Quality Control.
- 17 F. Closeout Submittals
 - 18 1. Project Record Documents: Submit under provisions of Section 017800.
 - 19 a. Record actual locations of grounding systems and penetration of building envelope.
 - 20 2. Operation and Maintenance Data: Submit manufacturer's printed, recommended operation
 - 21 and maintenance data.
 - 22 3. Warranty: Submit specified product warranty in accordance with Section 017800.

23 1.06 QUALITY ASSURANCE

- 24 A. Single Source Responsibility: To ensure quality of appearance and performance, obtain equipment
- 25 for systems from single photovoltaic system installer or from manufacturers approved by photovoltaic
- 26 system installer.
- 27 B. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this
- 28 Section with minimum 3 years documented experience.
- 29 C. Installer Qualifications: Certified in writing by equipment manufacturers as qualified for installation
- 30 of specified systems. Must have NABCEP certification (North American Board of Certified Energy
- 31 Practitioners), 2 years design and installation of commercial experience, and proper licensing.
- 32 Provide contractor's license number from Authority Having Jurisdiction where project is located.
- 33 D. Regulatory Requirements:
 - 34 1. Provide system meeting requirements of National Electric Code (NEC), edition adopted by
 - 35 local jurisdiction, containing information on photovoltaic systems such as grounding,
 - 36 conductor, over-current protection, disconnect, and labeling requirements.
 - 37 2. Provide system meeting requirements of federal, state, and local building codes.
 - 38 3. Provide system that meets or exceeds Alliant Energy interconnection requirements for self-
 - 39 generating equipment.
 - 40 4. Provide system components compliant with requirements of IEEE 1547-2003 Standard for
 - 41 Interconnecting Distributed Resources with Electric Power Systems.
 - 42 5. Provide Photovoltaic modules compliant with requirements of UL-1703 - Standard for Flat
 - 43 Plate Photovoltaic Modules and Panels
- 44 E. Certifications: Submit system component manufacturer's certification that products furnished for
- 45 Project meet or exceed specified requirements.
- 46

1 1.07 PRE-INSTALLATION CONFERENCE

- 2 A. Conduct pre-installation conference in accordance with Section 26 31 11.
- 3 B. Review requirements of Contract Documents and submittals.
- 4 C. Review anchor and weather-tight installation requirements.

5 1.08 DELIVERY, STORAGE, AND HANDLING

- 6 A. Comply with requirements of Section 01 00 00.
- 7 B. Protect finished surfaces as necessary to prevent damage.
- 8 C. Do not use adhesive papers or sprayed coatings that become firmly bonded when exposed to sun.
- 9 D. Do not leave coating residue on any surfaces.
- 10 E. Replace damaged units.

11 1.09 PROJECT CONDITIONS

- 12 A. Environmental Requirements:
 - 13 1. Do not install system during rain, snow, or windy conditions.
 - 14 2. Work on a dry roof only.
- 15 B. Existing Conditions: Ensure existing conditions are stable, solid, and ready to accept new
- 16 construction.

17 1.10 WARRANTY

- 18 A. Furnish Standard PV modules and panel components providing manufacturer's limited warranty of
- 19 (10) years product and (25) years service minimum.
- 20 B. Furnish DC to AC inverters covered by manufacturer's warranty for minimum of 5 years.

21 PART 2 - - PRODUCTS

22 2.01 MANUFACTURERS

- 23 A. Basis of Design PV Module Manufacturers:
 - 24 1. See Section 26 31 12.
- 25 B. Basis of Design Inverter Manufacturers:
 - 26 1. Fronius IG <http://www3.fronius.com/solar.electronics/products/froniusig/index.htm>.
 - 27 2. SatCon: www.satcon.com.
 - 28 3. SMA America: www.sma-america.com.
 - 29 4. Xantrex

30 2.02 REQUIRED EQUIPMENT

- 31 A. DC to AC Inverter:
 - 32 1. Sized to provide maximum power point tracking for voltage and current range expected from
 - 33 photovoltaic array for temperatures and solar insolation conditions expected for Project
 - 34 conditions.
 - 35 2. Capable of adjusting to "sun splash" from all possible combinations of cloud fringe effects
 - 36 without interruption of electrical production.
 - 37 3. Listed to UL 1741.
- 38 B. Mounting System:
 - 39 1. See Section 26 31 11.

- 1 C. AC Disconnect Switch:
 - 2 1. Coordinate with local electric utility service provider requirements.
 - 3 2. Provide switch to disconnect ungrounded AC conductors.
 - 4 3. Lockable, gang operated type, clearly indicating open and closed positions.
 - 5 4. Easily visually inspected to determine that switch is in open or closed position and clearly
 - 6 labeled in compliance with NEC and local electric utility service provider requirements.
- 7 D. Dedicated kWh Meter: Install in readily accessible, outdoor, location between DC to AC inverter and
- 8 interconnection with electric utility service provider to meter power produced by photovoltaic system.
- 9 Refer to local electric utility service provider requirements.

10 2.03 ACCESSORIES

- 11 A. Provide Accessories for complete operating system, including:
 - 12 1. Data Display.(including software and hardware).
 - 13 2. Combiner Boxes
 - 14 3. DC Disconnect.

15 PART 3 - EXECUTION

16 3.01 EXAMINATION

- 17 A. Verify items provided by other Sections of work are properly sized and located.
- 18 B. Examine supporting members to ensure surfaces are at proper elevation and are free from dirt or other
- 19 deleterious matter.

20 3.02 INSTALLATION

- 21 A. Locate PV array as shown on Drawings and approved shop drawings.
- 22 B. Install photovoltaic system in accordance with NEC, manufacturer's printed instructions, electric
- 23 utility service provider requirements, and approved shop drawings.
- 24 C. Install PV modules and DC to AC inverters with sufficient clearance to allow for proper ventilation
- 25 and cooling.
- 26 D. Comply with manufacturer's clearance recommendations.
- 27 E. Preferred installation requires operational PV modules in location and manner to ensure maximum
- 28 unobstructed, direct sun exposure.
- 29 F. Provide suitable means to secure attachments to mounting surfaces and structures.
- 30 G. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress
- 31 when maximum loads are applied.
- 32 H. Allow for expansion and contraction due to thermal changes and structural movement without
- 33 detriment to appearance or performance.
- 34 I. Installer shall verify that site, mounting surface substrate, supports and other site and work conditions
- 35 are adequate and proper for installation.
- 36 J. Optimum Orientation for Roof Installation:
 - 37 1. Optimum azimuth orientation: Install PV modules and panels to face within 15 degrees east or
 - 38 west of true south, not magnetic south.
 - 39 2. Optimum tilt angle orientation: Install PV modules and panels at a tilt angle of 35 degrees..

40 3.03 FIELD QUALITY CONTROL

- 41 A. Site Tests: Comply with requirements of Section 01 91 00.

42

- 1 3.04 ADJUSTING
- 2 A. Test and adjust operating functions in accordance with manufacturer's instructions to ensure smooth
3 operation.
- 4 3.05 CLEANING
- 5 A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic
6 smears, foreign materials, and other unsightly marks.
- 7 B. Clean metal surfaces exercising care to avoid damage.
- 8 C. Clean energy generating surfaces of the PV module to ensure no obstructions block sunlight.
- 9 3.06 COMMISSIONING
- 10 A. Provide system commissioning under provisions of Section 01 91 00.
- 11 B. Commissioning:
- 12 1. Prior to commissioning ensure PV system has passed and received final inspection certificate
13 from authorities having jurisdiction and local utility.
- 14 2. Provide training to designated Owners representative.
- 15 3. Ensure the installation has been performed in accordance with NEC and other local codes.
16 Following NEC articles refer to PV systems:
- 17 a. Article 690, Solar Photovoltaic Systems
- 18 b. Article 230: Service Equipment - Disconnecting Means
- 19 c. Article 240: Overcurrent Protection
- 20 d. Article 250: Grounding
- 21 e. Article 300: Wiring Methods
- 22 f. Article 310: Conductors for General Wiring
- 23 g. Article 705: Interconnected Electric Power Production Sources
- 24 4. Refer to commissioning requirements contained within IEEE 1547.1 Standard Conformance
25 Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power
26 Systems.
- 27 5. Provide suitable tools and equipment for commissioning.
- 28 6. Utilize System Commissioning Check sheet / Log sheet.
- 29 7. Provide commissioning certificate to Owner.
- 30 3.07 PROTECTION
- 31 A. Protect finished work in accordance with Section 01 00 00.

1 **SYSTEM COMMISSIONING CHECKSHEET / LOG SHEET**
 2

Date & Time				
Weather (Sunny, Cloudy, Rain, etc.)				
Air Temperature (°F or °C)				
Module Backskin Temperature (°F/ °C)				
Irradiance at plane of array (W/m ²)				
Source Circuit	DC Open Circuit Voltage	DC Short Circuit Current	Positive to Ground Resistance	Negative to Ground Resistance
	(350-600 Volts) §	(0-8.0 Amps) £	(M-Ohms)	(M-Ohms)
String #1				
String #2				
String #3				
String #4				
String #5				
String #6				
String #7				
String #8				
String #9				
String #10				
String #11				
String #12				
Notes:				

3 § Warning: Make certain the digital voltage meter you are using is rated for 600 volts DC minimum, calibrated
 4 with certification (traceable), and is in good working order.

5 £ Note: most handheld digital multimeters have the capability to measure a maximum of 10 Amps DC of short
 6 circuit current. A quality multimeter will have a fuse in line in order to protect itself. However, do not electrically
 7 short a solar module or panel if you suspect its output to be greater than 10 Amps. DC current clamp meters are
 8 readily available in the market.

9 **END OF SECTION**

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SECTION 26 31 11

MOUNTING STRUCTURES FOR SOLAR MODULES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Roof Mount Fixed Angle PV Array Racking System
- B. Accessories.

1.02 RELATED SECTIONS

- A. Section 05 50 00 - Metal Fabrications: Frames and supports.
- B. Section 09 90 00 - Paints and Coatings: Field applied paint finish.
- C. Section 26 31 12 – Photovoltaic Panels.
- D. Section 26 31 10 - Photovoltaic Generating System.

1.03 REFERENCES

- A. ASTM A 510 - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheet/coil, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. Aluminum 6063-T6 Extruded aluminum.
- D. ASTM A 1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- E. ASTM F1136 / F1136M - 11 Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
- F. ASTM A123 / A123M - 09 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- G. ASTM A780 A780 - 09 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings , coatings—zinc, galvanized coating repair
- H. UL 2703 – Rack Mounting Systems and Clamping devices for flat-plated Photovoltaic module and panels
- I. ASCE 7-05 - Minimum Design Loads for Buildings and Other Structures

1 1.04 DESIGN / PERFORMANCE REQUIREMENTS

- 2 A. Structural Performance:
- 3 1. Design to resist ASCE 7-05 - Minimum Design Loads for Buildings and Other
- 4 Structures.
- 5 2. Design all materials, assembly and attachments to resist snow, wind, and uplift loading
- 6 at any point without damage or permanent set.
- 7 3. Design to be suitable for Occupancy Category IV, Risk Category IV.
- 8 B. Compatibility: Varco Pruden standing seam metal roof 24 Gage type SSR Galvalume finish.

9 1.05 SUBMITTALS

- 10 A. Submit under provisions of Section 01 00 00.
- 11 B. Product Data: Manufacturer's data sheets on each product to be used, including:
- 12 1. Preparation instructions and recommendations.
- 13 2. Storage and handling requirements and recommendations.
- 14 3. Installation methods.
- 15 C. Shop Drawings: Layout and erection drawings showing typical cross sections and
- 16 dimensioned locations of all frames and base supports. Include erection drawings, elevations,
- 17 and details where applicable.
- 18 D. Design Data: Structural design calculations, bearing seal and signature of licensed Wisconsin
- 19 professional engineer. Include reactions at base supports for verification of roof structure.
- 20 E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- 21 F. Manufacturers warranties.

22 1.06 QUALITY ASSURANCE

- 23 A. Manufacturer Qualifications: Manufacturer with a minimum three years documented
- 24 experience in producing structural PV mounting systems.
- 25 B. Installer Qualifications: Installer with a minimum two years documented experience in
- 26 installing similar systems.
- 27 C. Pre-Installation Meeting:
- 28 1. Convene at job site, at least seven calendar days prior to scheduled beginning of
- 29 construction activities of this section, to review requirements of this section.
- 30 2. Require attendance by representatives of the solar module, roof support installer, the
- 31 solar module installer, the roof and roof insulation installers and other entities affected
- 32 by construction activities of this section.

33 1.07 DELIVERY, STORAGE, AND HANDLING

- 34 A. Receive, handle and store materials in conformance with the manufacturers printed
- 35 instructions.
- 36 B. Store products undercover, in manufacturer's unopened packaging until ready for installation.
- 37 C. Store materials in a dry, weather tight location. Protect materials from exposure to moisture.

38
39

1 1.08 SEQUENCING

2 A. Ensure that locating templates and other information required for installation of products of
3 this section are furnished to affected trades in time to prevent interruption of construction
4 progress.

5 B. Ensure that products of this section are supplied to affected trades in time to prevent
6 interruption of construction progress.

7 1.09 WARRANTY

8 A. Manufacturer's Limited Warranty: 5 years structural framing system.

9 1.10 COORDINATION

10 B. Coordinate Work with module manufacturer and installer to verify collector mounting and
11 framework modules with material specified in Section 26 31 10 and 26 31 11.

12 C. Coordinate Work with other operations and installation of roofing materials to avoid damage
13 to installed insulation and membrane materials.

14 D. See Structural plans for permissible attachment points.

15 PART 2 - PRODUCTS

16 2.01 MANUFACTURERS

17 A. Acceptable Manufacturer: Schletter Inc., Located at. 3761 East Farman Place Tucson, Arizona
18 85706. Contact Blaz Ruzic @ 520-289-8700.

19 Web address: www.Schletter.us

20 Quotations: mail@schletter.us

21 B. Equivalent Systems by Legrand/Cablofil or Cooper B-Line are acceptable.

22 C. Requests for substitutions will be considered in accordance with provisions of Section 01 00
23 00.

24 2.02 MATERIALS

25 A. The structure shall be designed and detailed according to good engineering practice. The
26 structure shall be a series of connected galvanized steel, wire welded frames. The system shall
27 be Schletter Inc. CompactGrid system designed for standing seam metal roofs and special
28 construction with reduced load onto the roof substructures .

29 B. Structure shall be made of applicable corrosion resistant materials including aluminum alloy
30 rails (6105T5).

31 C. Mounting structures shall have a nominal slope of 15 degrees.

32 D. Provide S-5! clamps to attach frames to roof seams for quick installation time and reduced
33 installation cost. Provide one clamp per standing seam. Provide two DN rails running
34 perpendicular to the frames, attached to the S-5! clamps.

35 E. Sub-divide the DN rail supports to allow for thermal expansion.

36 F. Hardware: Bolts, nuts, washers and screws Geomet coated.

1 G. Module Hold-Down assembly: Fabricated from electrically conductive corrosion resistant
2 materials including Aluminum 6063-T6, 304 stainless steel and Geomet fastener.

3 2.03 FABRICATION

4 A. Supply components required for anchorage of fabrications. Fabricate anchors and related
5 components of same material and finish as fabrication, except where specifically noted
6 otherwise.

7 PART 2 - EXECUTION

8 3.01 EXAMINATION

9 A. Examine installation area to verify the work can be performed in accordance with the
10 Drawings and structural calculations without interferences from other equipment or trades.

11 B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory
12 preparation before proceeding.

13 3.02 PREPARATION

14 A. Clean surfaces thoroughly prior to installation.

15 B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best
16 result for the substrate under the project conditions.

17 3.03 INSTALLATION

18 A. Install in accordance with manufacturer's instructions.

19 B. Install components plumb and level, per manufacturers direction, support spacing, torque, and
20 other recommendations. Expansion allowance per Manufacturers recommendations,
21 Components to be accurately fitted, free from distortion or defects.

22 C. Provide for erection loads, and for sufficient temporary bracing to maintain indicated
23 alignment until completion of erection and installation of permanent attachments.

24 D. Exercise care when installing components so as not to damage finish surfaces. Touch up as
25 required to repair damaged finishes.
26

27 3.04 PROTECTION

28 A. Protect installed products until completion of project.

29 B. Touch-up, using ASTM A123 / A123M - 09 Standard Specification for Zinc (Hot-Dip
30 Galvanized) Coatings on Iron and Steel Products repair or replace damaged products before
31 Substantial Completion.
32

33 END OF SECTION

SECTION 26 31 12

PHOTOVOLTAIC PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. SolarWorld Sunmodule.
- B. Related Accessories.

1.02 REFERENCES

All equipment and calculations shall comply with requirements of the latest revision of the relevant standards of:

- A. NEC: National Electric Code.
- B. NEMA: National Electric Manufacturers Association.
- C. ANSI: American National Standards Institute.
- D. IEC: International Electro Technical Commission.
- E. NFPA: National Fire Protection Association.
- F. ASTM: American Society for Testing and Materials.
- G. ASCE (7-05 or 7-10): Minimum Design Loads for Buildings and Other Structures.
- H. IBC (2006, 2009 or 2012): International Building Codes.
 - 1. Testing Sources
 - a. IEC 61215: Crystalline Silicon Terrestrial Photovoltaic Modules.
 - b. IEC 61730: Photovoltaic Module Safety Qualification.
 - c. IEC 61701: Salt Mist Corrosion Testing of Photovoltaic Modules.
 - d. UL 1703: Flat-Plate Photovoltaic Modules and Panels.

1.03 GENERAL REQUIREMENTS

- A. This Section of the Specifications applies to all electrical work. The General Conditions, Supplementary Conditions, Summary of the Work, Instructions to Bidders and all Sections of the Conditions of the Contract form a part of these specifications and the Contractor shall consult them in detail. Electrical work indicated in other Sections of the Specifications to be done by the Electrical Contractor shall be included in the Work of this Section.

1.04 DESIGN / PERFORMANCE REQUIREMENT

- A. Structural Performance:
 - 1. Design in accordance to ASCE 7-05 – Minimum Design Loads for Buildings and other Structures.
 - 2. Design all materials, component and claddings to resist snow, wind, suction and uplift loading at any point without damage. Solar Panels do not need to be designed for live loads as they are not meant to be walked upon.
- B. The design for the package shall be in agreement with the appropriate codes, standards and regulations.
 - 1. Drawings specifying package envelope along with manufacturer’s data sheets.
 - 2. Weight and other interface.
 - 3. Technical specifications.

- 1 4. Schedule of Manufacturing and delivery.
- 2 5. Consistency and convenience of gathering data.
- 3 6. Clarifications and exclusions.
- 4 7. Recommended spare parts list.

5 1.05 SUBMITTALS

- 6 A. Product Data: Provide Manufacturer’s documents on products, containing:
 - 7 1. Data sheets.
 - 8 2. Installation instructions.
- 9 B. Shop Drawings: Physical and electrical layout and drawings including details (where applicable) for
10 permitting purposes.
- 11 C. Design Data: Structural design calculations with signature of professional engineer licensed to
12 practice in the state with respect to project’s location.
- 13 D. Manufacturer’s Certificates: Certify products exceed specified specifications.
- 14 E. Manufacturer’s warranties.

15 1.06 QUALITY ASSURANCE

- 16 A. Manufacturer qualifications: SolarWorld America LLC.
- 17 B. Installer qualifications: SolarWorld ISO 9001certified installer with documented experience in
18 installing comparable systems.
- 19 C. Pre-Installation Meeting:
- 20 D. Convoke at job site beforehand to the scheduled beginning of construction of this section, to review
21 specifications of this section.

22 1.07 DELIVERY, STORAGE, AND HANDELING

- 23 A. Receive, handle and store materials in conformance with the manufacturers printed instructions.
- 24 B. Stock products under protection cover, in manufacturer's unopened packaging until the installation’s
25 start.
- 26 C. Stock supplies in a locations in accordance to manufacturer’s guidelines. Protect materials from
27 exposure to moisture.
- 28 D. Roof Placement: Avoid overloading the roof structure by spreading the bundles and crates.
29 Recommended location is over major supports such as beams (girders) or trusses.

30 1.08 SEQUENCING

- 31 A. Confirm that appropriate information required for installation of products of this section are well-
32 appointed in time to avoid interruption of construction.
- 33 B. Confirm that products of this section are provided in time to avoid interruption of construction.

34 1.09 WARRANTY

- 35 A. Manufacturer Limited Warranty: Ten (10) years product warranty.
- 36 B. Manufacturer Limited Warranty: Twenty-Five (25) year service warranty.

37

1 PART 2 - PRODUCTS

2 2.01 MANUFACTURERS

- 3 A. Acceptable Manufacturer: SolarWorld America LLC, which is located at:
- 4 1. 4650 Adohr Lane; Camarillo, CA 93012; Tel: 805-388-6590; Email: request info
- 5 (customerservice@solarworld-usa.com); Web: www.solarworld.com.
- 6 2. 25300 NW Evergreen Road; Hillsboro, OR 97124; Tel: 503-844-3400;
- 7 B. Substitutions: per Section 01 00 00.

8 2.02 MATERIALS

- 9 A. Metals: Aluminum sheets and plates used in the construction of modules shall be compliant to ASTM
- 10 B209.
- 11 B. Backsheet: Thin polymer sheets to be used which provide the following key functions:
- 12 1. Physical protection from puncture and abrasion.
- 13 2. Moisture protection and low thermal resistance.
- 14 3. Electrical insulation to isolate the cells and connections from the environment.
- 15 4. UV and moisture stability over the life of the module. Prevent ingress of water or water vapor.
- 16 5. Improve efficiency through optimized internal reflection.
- 17 C. Glass Cover: Anti-reflective tempered glass to be used as the protective shield for the active surface
- 18 area of the module. To be carefully chosen for high impact and thermal shock resistance.
- 19 D. Encapsulation: The encapsulant shall fill all spaces inside the module and shall adhere to the front
- 20 glass and the backsheet. The encapsulant should be stable at elevated temperature and high UV
- 21 exposure.
- 22 E. Cell Material: All the photovoltaic cells within the module are made from crystalline silicon. These
- 23 cells are produced through advanced printing technology and using proprietary surface texturing to
- 24 enhance sunlight capture.
- 25 F. Junction Box: Each module shall have a sealed junction box. This box shall not extend more than one
- 26 and three-quarters inch (1¾") from the backsheet of the module. This junction box shall contain both
- 27 the positive and negative output terminal posts. The junction box shall contain a small replaceable
- 28 cover for easy access for replacement of the blocking diode. The junction box shall be completely
- 29 filled with a soft, clear, removable, self-healing, room temperature cure, dielectric potting gel leaving
- 30 no air gaps.
- 31 G. Intercell Connections: Intercell connections contained by the module shall be ready to allow for
- 32 thermal expansion and to discharge mechanical stress. Intercell electrical contacts to the collector grid
- 33 contact area of one cell and the back contact area of the next cell shall be provided. These connections
- 34 shall be designed such that failure of any contact shall not degrade the individual cell electrical output
- 35 by more than 5% from its output under Standard Test Conditions (STC). Solder shall cover the
- 36 contact area where the intercell connection overlays the front cell area of one cell and the back contact
- 37 area of the next cell.
- 38 H. The positive and negative of cell outputs usually drive through the backsheet of the module. After the
- 39 positive and negative outputs are soldered onto the outside of the solar panel, it is essential to connect
- 40 the positive and negative outputs with positive and negative output cables inside the Junction Box.

41 2.03 FABRICATIONS

- 42 A. No fabrication or alteration to the module without prior express written consent of the module
- 43 manufacturer.

44 2.04 CERTIFICATIONS

- 1 A. IEC 61701: Sunmodule Plus and Sunmodule off-grid; Salt Mist Corrosion certificate by SGS.
 2 B. IEC 61730: Sunmodule Plus and Sunmodule Off-grid; photovoltaic module safety qualification by
 3 TUVRheinland; ID: 0000022848.
 4 C. IEC 61215: Sunmodule Plus and Sunmodule Off-grid; crystalline silicon terrestrial photovoltaic
 5 modules by TUVRheinland; ID: 0000022848.
 6 D. Intertek Listing (UL 1703): Standard for Flat-Plate Photovoltaic Modules and Panels.
 7 E. ISO 9001-14001: Design and sales of photovoltaic equipment and systems.
 8 F. UL 1703: Standard for Safety for Flat-Plate Photovoltaic Modules and Panels.
 9 G. UL 4703: SolarWorld's proprietary IP-65 junction box.
 10 H. UL 1581: SolarWorld's PV Wire cables.

11 2.05 Electrical Performance

- 12 A. Provide Electrical performance per following table.

Module Output	270 W
Module type	mono
Max power (Pmax) (Wp)	
STC*	270
NOCT*	194.9
Voltage at Pmax (Vmpp) (V)	
STC	32.1
NOCT	28.9
Current at Pmax (Impp) (A)	
STC	8.42
NOCT	6.74
Short circuit current (Isc) (A)	
STC	8.9
NOCT	7.19
Open Circuit Voltage (Voc) (V)	
STC	38.3
NOCT	34.5
Module efficiency	16.10%
Tolerance (Wp)	±5
Nominal Voltage (Wp)	270

*STC: 1000W/m2, 25°C, AM 1.5

*NOCT: 800W/m2, 20°C, AM 1.5

1 PART 3 - EXECUTIONS

2 3.01 EXAMINATION

- 3 A. Inspect installation region to validate the project can be completed in agreement with the drawings
4 and structural calculations with no interruption from other equipment or trades.
- 5 B. Do not start installation till drawings and calculations have been accurately prepared.
- 6 C. If planning is the duty of alternative installer, notify Architect of unacceptable planning before
7 proceeding.

8 3.02 PREPARATION

- 9 A. Clean all surfaces including modules thoroughly preceding installation.
- 10 B. Arrange surfaces in accordance to manufacturer recommendation for project conditions.
- 11 C. Insure mounting rails or other type systems are properly secured and able to properly support the
12 modules.

13 3.03 INSTALLATION

- 14 A. Install in accordance with manufacturer's instructions.
- 15 B. Make sure that the module meets the technical requirements of the overall system.
- 16 C. Other system components shall not exert any adverse mechanical or electrical influences on the
17 module.
- 18 D. To avoid performance losses, all modules connected in series should be arranged with the same
19 orientation and tilt angle.
- 20 E. Try to reduce possibility of corrosive or electrolytic action between metals.
- 21 F. Implement care while installing components so as not to damage finish surfaces.
- 22 G. Touch up as required to repair damaged finishes.
- 23 H. Remove all protective masking from material immediately after installation.

24 3.04 PROTECTION

- 25 A. Protect installed products until execution of project.
- 26 B. Touch-up, repair or replace damaged products before completion.
- 27 C. Regular inspection of the system to ensure:
- 28 1. All fixtures are securely tightened and corrosion free.
- 29 2. Wiring is securely connected, properly arranged and free of corrosion.
- 30 3. Cables are free of damage.

31

32

END OF SECTION 26 31 12

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SECTION 26 43 13

TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide a separate price to furnish and install transient voltage surge suppressors as shown on the Drawings and herein specified.

1.02 QUALITY ASSURANCE

- A. Surge suppressors shall be listed and labeled under UL 1449 Third Edition 2009.
- B. Surge suppressors shall be tested to ANSI/IEEE standards C62.41 and C62.45.
- C. Each unit shall be designed and manufactured by a qualified manufacturer of power conditioning equipment. The qualified manufacturer must have been engaged in the design and manufacturer of such products for a minimum of five (5) years.
- D. Electrical Parameters defined in this specification shall be limited to those in NEMA TVSS Specification LS1-1992 and do not include "irrelevant terminology" such as response time.

1.03 MANUFACTURERS

- A. Surge Suppressors: Current Technology, Inc. or equals approved previous to bid time.

PART 2 - PRODUCTS

2.01 SERVICE ENTRANCE TVSS - MEDIUM EXPOSURE AREAS

- A. Protection Modes: SVR(6kV, 500A) and UL1449 3rd Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltage of 208Y/120 shall be as follows and comply with test procedures outlined in UL1449 3rd Edition section 37.6:

System Voltage	Mode	MCOV	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb. Wave	UL 1449 Second Edition SVR Rating	UL 1449 Fourth Edition VPR Rating
120/240	L-N	150	420	642	1040	400	800
120/208	L-G	150	480	690	1300	400	800
	N-G	150	340	620	1240	400	800
	L-L	300	610	1010	1420	700	1200

- B. Electrical Noise Filter- each unit shall include a high performance EMI/RFI noise rejection filter. Noise attenuation for electric noise shall be as follows using the MIL-STD-220B insertion loss test method.
- C. 100 kHz at 33 db or better.
- D. All other frequencies should be 32 db or better.
- E. Each Unit shall provide the following features:
 1. Phase Indicator lights, Form C dry contacts, surge counter and audible alarm.
 2. Field testable while installed.
- F. The manufacturer shall provide a limited ten year warranty against failure.

SECTION 26 43 13

TRANSIENT VOLTAGE SURGE SUPPRESSION

- G. Each individual MOV and capacitor shall be fused so that the failure of any component does not affect the operation or protection of the entire unit.
- H. Manufacturer of the TVSS device must provide certified test data from an independent test lab showing that their unit of each rating has successfully passed the IEEE standard 8 x 20 microsecond waveform at the surge current capacity called for in the specification.
- I. Surge suppressor shall be Current Technology TG100-120/208-3GY-L3 or engineer approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Each unit shall be installed per Manufacturer's recommended installation and wiring practices, as show on the drawing supplied.
- B. The UL 1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.
- C. The UL 1449 Nominal Discharge Surge Current Rating shall be a minimum of 20kA
- D. The SCCR rating of the SPD shall be 200kAIC without requiring an upstream protective device for safe operation.
- E. The unit shall be listed as a Type 1 SPD, suitable for use in both Type 1 and Type 2 locations per UL1449 3rd Edition.
- F. The SPD manufacturer's technician shall perform a system checkout and start-up in the field to assure proper installation, operation and to initiate the warranty of the system. The technician will be required to do the following:
 - 1. Verify voltage clamping levels by using the DTS-2 test equipment.
 - 2. Verify N-G connection where applicable.
 - 3. Record information to product signature card for each product installed.
- G. Surge Suppressors shall be installed as close as possible to the equipment being protected.
- H. TVSS devices designed with replaceable modules shall be furnished with one full set of spare modules to maintain system integrity.

END OF SECTION

SECTION 26 51 13

LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.02 SUMMARY

- A. Section Includes:
1. Interior lighting fixtures.
 2. Exterior lighting fixtures.
 3. Lamps.
 4. Ballasts.
 5. Emergency lighting units.

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
1. C78 Series - Lamps.
 2. C82.2-84 - Fluorescent Lamp Ballasts.
 3. C82.4-85 - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
 4. ANSI C2-90 - National Safety Code.
- B. Institute of Electrical and Electronics Engineers (IEEE):
1. C62.41-91 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- C. National Fire Protection Association (NFPA):
1. 70-93 - National Electric Code.
- D. Underwriters Laboratory (UL):
1. 844-90 - UL Standard for Safety Electric Lighting Fixtures for Use in Hazardous (Classified) Locations.
 2. 924-90 - UL Standard for Safety Emergency Lighting and Power Equipment.
 3. 935-84 - UL Standard for Safety Florescent-Lamp Ballast.
 4. 1092 (P) - UL Standard for Safety Proposed First Edition of the Standard for Process Control Equipment.
 5. 1570-88 - UL Standard for Safety Florescent Lighting Fixtures.
 6. 1571-91 - UL Standard for Safety Incandescent Lighting Fixtures.
 7. 1572-91 - UL Standard for Safety High Intensity Discharge Lighting Fixtures.
 8. 1573-85 - UL Standard for Safety Stage and Studio Lighting Units.
 9. 1574-87 - UL Standard for Safety Track Lighting Systems.
 10. UL 773-87 - UL Standard for Safety Plug-In, Locking Type Photo controls for Use with Area Lighting.

- 1 E. RoHS - Restriction of Hazardous Substances. Council of the European Union (EC) Directive
2 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic
3 equipment.
- 4 F. LM-79-08 (or latest) - IES Approved Method for the Electrical and Photometric Measurements of
5 Solid-State Lighting Products.
- 6 G. LM-80-08 (or latest) - IES Approved Method for Measuring Lumen Maintenance of LED Light
7 Sources.
- 8 H. TM-21-11 (or latest) - IES Technical Memorandum on Projecting Long Term Lumen Maintenance of
9 LED Light Sources.
- 10 I. NEMA SSL 1-2010 (or latest) - Electronic Drivers for LED Devices, Arrays, or Systems.

11 1.04 DEFINITIONS

- 12 A. Emergency Lighting Unit: Fixture with integral emergency battery power supply and means for
13 controlling and charging battery. Also known as emergency light set. Emergency units are available
14 with integral lamps only.
- 15 B. Fixture: Complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and
16 parts required to distribute light, position and protect lamps, and connect lamps to power supply.
17 Internal battery powered exit signs and emergency lighting units also include battery and means for
18 controlling and recharging battery. Emergency lighting units are available with and without integral
19 lamp heads and lamps.
- 20 C. Luminaire: Fixture.
- 21 D. Average Life: Time after which 50% will have failed and 50% will have survived under normal
22 conditions.

23 1.05 SUBMITTALS

- 24 A. Product Data:
 - 25 1. Describe fixtures, lamps, ballasts, poles, emergency lighting units, and accessories.
26 Arrange product data for fixtures in order of fixture designation. Include data on
27 features and accessories and following information:
 - 28 a. Outline drawings of fixtures indicating dimensions and principal features.
 - 29 b. Electrical ratings and photometric data with specified lamps and certified
30 results of independent laboratory tests.
 - 31 c. Data on batteries and chargers of emergency lighting units.
- 32 B. Shop Drawings: Detail nonstandard fixtures and indicating dimensions, weights, methods of field
33 assembly, components, features, and accessories.
- 34 C. Samples: Submit sample of fixture if different than specified.
- 35 D. Miscellaneous:
 - 36 1. For substitutes only, product certifications signed by manufacturers of lighting
37 fixtures certifying that their fixtures comply with specified requirements.
 - 38 2. Warranty for rechargeable battery.
 - 39 3. Coordination drawings for fixtures that require coordination with other equipment
40 installed in same space.
- 41 E. Submit in accordance with Division 1.
- 42

1 1.06 QUALITY ASSURANCE

- 2 A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized
3 Testing Laboratory (NRTL).
- 4 1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
5 2. Terms "listed" and "labeled" shall be as defined in National Electric Code, Article
6 100.
- 7 B. Regulatory Requirements:
- 8 1. National Electric Code: Components and installation shall comply with NFPA 70.
9 2. Comply with ANSI C2, "National Electrical Safety Code".
- 10 C. Coordinate fixtures mounting hardware and trim with ceiling tile.

11 1.07 WARRANTY

- 12 A. Requirements:
- 13 1. Special Project Warranty Period (Where called for herein.): 10 years, beginning on
14 date of Substantial Completion. Full warranty shall apply for first year of period, and
15 prorata warranty for last 9 years.
- 16 2. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish
17 due to weathering.
- 18 3. Color Retention: Warranty against fading, staining, chalking due to effects of weather
19 and solar radiation.

20 PART 2 - PRODUCTS

21 2.01 FIXTURES, GENERAL

- 22 A. Comply with requirements specified in Articles below and lighting fixture schedule.

23 2.02 FIXTURE COMPONENTS, GENERAL

- 24 A. Metal Parts: Free from burrs, sharp corners, and edges.
- 25 B. Sheet Metal Components: Steel, except as indicated. Form and support components to prevent
26 warping and sagging.
- 27 C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under
28 operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames,
29 lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in
30 operating position.
- 31 D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
- 32 1. White surfaces: 85%.
33 2. Specular Surfaces: 83%.
34 3. Diffusing Specular Surfaces: 75%.
35 4. Laminated Silver Metallized Film: 90%.
- 36 E. Exterior Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or
37 deform in use. Provide filter/breather for enclosed fixtures.
- 38 F. Exterior Exposed Hardware Material: Stainless steel.
39

- 1 G. Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or water white, annealed crystal
2 glass except as indicated.
- 3 1. Plastic: Highly resistant to yellowing and other changes due to aging, exposure to
4 heat and UV radiation.
- 5 2. Lens Thickness: 0.125 inches, minimum.
- 6 H. Photoelectric Relay: UL 773.
- 7 1. Contact Relays: Single-throw, arranged to fail in the "on" position and factory set to
8 turn light unit on at 1.5 to 3 footcandles and off at 4.5 to 10 footcandles with 15
9 seconds minimum time delay.
- 10 2. Relay Mounting: In fixture housing.

11 2.03 SUSPENDED FIXTURE SUPPORT COMPONENTS

- 12 A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same
13 as fixture.
- 14 B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount single fixture.
15 Finish same as fixture.
- 16 C. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.
- 17 D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded
18 attachment, cord, and locking-type plug.

19 2.04 LED Luminaires

- 20 A. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification
21 Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's®
22 Qualified Products List, but they must meet the Product Qualification Criteria. The technical
23 requirements that the luminaire shall meet for each Application Category are:
- 24 1. Minimum Light Output.
- 25 2. Zonal Lumen Requirements.
- 26 3. Minimum Luminaire Efficacy.
- 27 4. Minimum CRI.
- 28 5. L70 Lumen Maintenance.
- 29 6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and
30 all LED components.

31 *Additional requirements:*

- 32
- 33 B. Color Temperature of 3000K-5000K for interior fixtures as listed in the Light Fixture Schedule on the
34 plans. The color temperature of exterior LED fixtures should not exceed 4100K (nominal).
- 35 C. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process
36 to achieve consistent fixture-to-fixture color for interior fixtures. Exterior fixtures shall use a
37 maximum 5-step MacAdam Ellipse binning process.
- 38 D. Glare Control: Exterior fixtures shall meet DesignLights Consortium's® criteria for Zonal Lumen
39 Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior fixtures.
- 40 E. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- 41 F. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- 42 G. Light output of the LED system shall be measured using the absolute photometry method following
43 IES LM-79 and IES LM-80 requirements and guidelines.
- 44 H. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.

- 1 I. Driver shall have a rated life of 50,000 hours, minimum.
- 2 J. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
- 3 K. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
- 4 L. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior fixtures, and a
5 minimum of 70 for exterior fixtures.
- 6 M. LED fixture shall be thermally designed as to not exceed the maximum junction temperature of the
7 LED for the ambient temperature of the location the fixture is to be installed. Rated case temperature
8 shall be suitable for operation in the ambient temperatures typically found for the intended
9 installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to
10 50°C).
- 11 N. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at
12 full input power and across specified voltage range.
- 13 O. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- 14 P. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and
15 across specified voltage range.
- 16 Q. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
- 17 R. All connections to luminaires shall be reverse polarity protected and provide high voltage protection
18 in the event connections are reversed or shorted during the installation process.
- 19 S. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be
20 either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2
21 UL listing.
- 22 T. All luminaires shall be provided with knockouts for conduit connections.
- 23 U. The LED lighting fixture shall carry a limited 5-year warranty minimum for LED light
24 engine(s)/board array, and driver(s).
- 25 V. Provide all of the following data on submittals:
 - 26 1. Delivered lumens
 - 27 2. Input watts
 - 28 3. Efficacy
 - 29 4. Color rendering index.

30
31 *Emergency LED Fixture Compatibility with Inverters:*

- 32 W. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire
33 manufacturer that the fixture will function with a square-wave inverter.

34
35 *Dimming:*

- 36 X. LED driver shall be compatible with dimming controls where dimming is indicated on the plans.
37 Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM)
38 operation.
- 39 Y. LED fixtures shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Light Fixture Schedule
40 on the plans without visible flicker or “popcorn effect”. “Popcorn effect” is defined as the fixture
41 being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set
42 level when power is returned to the fixture.

43 **2.05 EXIT SIGNS**

- 44 A. Conform to UL 924.
 - 45 1. Sign Colors: Conform to local code.

1 2.06 EMERGENCY LIGHTING UNITS

- 2 A. Conform to UL 924. Provide self-contained units with following features and additional
3 characteristics as indicated.
- 4 1. Battery: Sealed, maintenance-free, lead-acid type with 10-year nominal life
5 minimum, and special project warranty.
 - 6 2. Charger: Minimum 2-rate, fully-automatic, solid-state type, with sealed transfer relay.
 - 7 3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to
8 80% of nominal or below. Lamp automatically disconnects from battery when
9 voltage approaches deep-discharge level. Relay disconnects lamps and battery
10 automatically recharges and floats on trickle charge when normal voltage is restored.
 - 11 4. Time-Delay Relay: Provide time-delay relay in emergency lighting unit control
12 circuit arranged to hold unit "on" for fixed interval after restoration of power from an
13 outage. Provide adequate time delay to permit HID lamps to restrike and develop
14 output.
 - 15 5. Wire Guard: Where indicated, provide heavy chrome plated wire guard arranged to
16 protect lamp heads or fixtures.

17 2.07 LAMPS

- 18 A. Conform to ANSI C78 series applicable to each type of lamp.

19 2.08 FINISH

- 20 A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks,
21 runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during
22 project warranty period and replace with new fixtures.
- 23 B. Other Parts: Manufacturer's standard finish.
- 24 C. Verify and provide light fixture finishes as selected by ARCHITECT for all light fixture types.
25 Include colored finish selection tables with product submittals. Upon request submit actual material
26 finish swatches for A/E review.

27 PART 3 - EXECUTION

28 3.01 INSTALLATION

- 29 A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according
30 to manufacturer's printed instructions and approved submittals.
- 31 B. Support For Recessed and Semirecessed Fixtures: Units may be supported from suspended ceiling
32 support system. Install ceiling system support rods or wires at minimum of four rods or wires per
33 fixture located not more than 6 inches from fixture corners.
- 34 1. Fixtures Smaller Than Ceiling Grid: Install minimum of four rods or wires for each
35 fixture and locate at corner of ceiling grid where fixture is located. Do not support
36 fixtures by ceiling acoustical panels.
 - 37 2. Fixtures of Sizes Less Than Ceiling Grid: Center in acoustical panel. Support
38 fixtures independently with at least two 3/4-inch metal channels spanning and secured
39 to ceiling tees.
 - 40 3. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at
41 or near each fixture corners.
- 42 C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit
43 swinging. Support stem mounted single-unit suspended fluorescent fixtures with twin-stem hangers.
44 For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for
45 each unit length of chassis, including one at each end.

1 D. Lamping: Lamp units according to manufacturer's instructions.

2 3.02 CONCRETE FOUNDATIONS

3 A. Construct concrete foundations with 3,000-pound, 28-day concrete conforming to requirements of
4 Division 3. Comply with details and manufacturer's recommendations for reinforcing, anchor bolts,
5 nuts, and washers.

6 3.03 GROUNDING

7 A. Ground fixtures and metal poles according to Section 26 05 11.

8 1. Poles: Install 10-foot driven ground rod at each pole.

9 2. Nonmetallic Poles: Ground metallic components of lighting unit and foundations.
10 Connect fixtures to grounding system with No. 6 AWG conductor.

11 3.04 FIELD QUALITY CONTROL

12 A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

13 B. Give 7-day notice of dates and times for field tests.

14 C. Verify normal operation of each fixture after fixtures have been installed and circuits have been
15 energized with normal power source.

16 D. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation.

17 a. Duration of supply.

18 b. Low battery voltage shut-down.

19 c. Normal transfer to battery source and retransfer to normal.

20 d. Low supply voltage transfer.

21 E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until units
22 operate properly.

23 3.05 ADJUSTING AND CLEANING

24 A. Clean fixtures upon completion of installation. Use methods and materials recommended by
25 manufacturer.

26 B. Adjust aimable fixtures to provide required light intensities.

27 END OF SECTION 26 51 13

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SECTION 27 10 00

TELECOMMUNICATIONS DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

- A. The basic scope of this project is as follows:
 - 1. Provide new cables and patch panels within the Bookmobile Building.
 - 2. Provide all certification and testing of the equipment and cabling as required.
- B. Section Includes: Equipment, materials, labor, and services to provide telephone and data distribution system including, but not limited to:
 - 1. Raceway and boxes
 - 2. Telephone and data cabling terminations
 - 3. Telecommunications outlets
 - 4. Terminal blocks/cross-connect systems
 - 5. System testing
 - 6. Documentation and submissions
- C. Provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.
- D. Work not included:
 - 1. The following work will be done by others:
 - a. Off-site services.
 - b. Providing data concentrators, hubs, servers, computers, and other active devices.

1.02 REFERENCES

- A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code®), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
 - 1. ANSI/NECA/BICSI-568 -- Standard for Installing Commercial Building Telecommunications Cabling
 - 2. ANSI/TIA/EIA Standards
 - a. ANSI/TIA/EIA-568-B.1 -- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
 - b. ANSI/TIA/EIA-568-B.2 -- Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
 - c. ANSI/TIA/EIA-568-B.3 -- Optical Fiber Cabling Components Standard
 - d. ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces
 - e. ANSI/TIA/EIA-606(A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - f. ANSI/TIA/EIA-607(A) -- Commercial Building Grounding and Bonding Requirements for Telecommunications
 - g. ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - h. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant

- 1 i. ANSI/TIA/EIA-758(A) -- Customer-Owned Outside Plant Telecommunications
2 Cabling Standard
- 3 B. Install cabling in accordance with the most recent edition of BICSI® publications:
- 4 1. BICSI -- Telecommunications Distribution Methods Manual
- 5 2. BICSI -- Cabling Installation Manual
- 6 3. BICSI -- LAN Design Manual
- 7 4. BICSI -- Customer-Owned Outside Plant Design Manual
- 8 C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part
9 of the specifications as if herein repeated or hereto attached. If the contractor should note items in the
10 drawings or the specifications, construction of which would be code violations, promptly call them to
11 the attention of the owner's representative in writing. Where the requirements of other sections of the
12 specifications are more stringent than applicable codes, rules, regulations, and ordinances, the
13 specifications shall apply.

14 1.03 PERMITS, FEES, AND CERTIFICATES OF APPROVAL

- 15 A. As prerequisite to final acceptance, supply to the owner certificates of inspection from an inspection
16 agency acceptable to the owner and approved by local municipality and utility company serving the
17 project.

18 1.04 SYSTEM DESCRIPTION

- 19 A. Telecommunications cabling system generally consists of one telecommunications outlet in each
20 workstation, wall telephones in common and mechanical areas and telecommunications rooms (TRs)
21 located on each floor.
- 22 B. The typical work area consists of a single-gang plate with three standards compliant work area outlets.
- 23 1. Each work area outlet consists of one (1) four-pair data Category 6 cable or above, installed
24 from work area outlet to the TR. Terminate data cables on rack mounted modular patch panels
25 located in the appropriate TR.

26 1.05 SUBMITTALS

- 27 A. Submit to the engineer/designer shop drawings, product data (including cut sheets and catalog
28 information), and samples required by the contract documents. Submit shop drawings, product data,
29 and samples with such promptness and in such sequence as to cause no delay in the work or in the
30 activities of separate contractors. The engineer/designer will indicate approval of shop drawings,
31 product data, and samples submitted to the engineer by stamping such submittals "APPROVED" with
32 a stamp. Submitted shop drawings shall be initialed or signed by the contractor, showing the date and
33 the contractor's legitimate firm name.
- 34 1. By submitting shop drawings, product data, and samples, the contractor represents that he or
35 she has carefully reviewed and verified materials, quantities, field measurements, and field
36 construction criteria related thereto. It also represents that the contractor has checked,
37 coordinated, and verified that information contained within shop drawings, product data, and
38 samples conform to the requirements of the work and of the contract documents. The
39 engineer/designer remains responsible for the design concept expressed in the contract
40 documents as defined herein.
- 41 2. The engineer's/designer's approval of shop drawings, product data, and samples submitted by
42 the contractor shall not relieve the contractor of responsibility for deviations from requirements
43 of the contract documents, unless the contractor has specifically informed the
44 engineer/designer in writing of such deviation at time of submittal, and the engineer/designer
45 has given written approval of the specific deviation. The contractor shall continue to be
46 responsible for deviations from requirements of the contract documents not specifically noted
47 by the contractor in writing, and specifically approved by the engineer in writing.
- 48

- 1 3. The engineer's/designer's approval of shop drawings, product data, and samples shall not
2 relieve the contractor of responsibility for errors or omissions in such shop drawings, product
3 data, and samples.
- 4 4. The engineer's/designer's review and approval, or other appropriate action upon shop
5 drawings, product data, and samples, is for the limited purpose of checking for conformance
6 with information given and design concept expressed in the contract documents. The
7 engineer's/designer's review of such submittals is not conducted for the purpose of
8 determining accuracy and completeness of other details such as dimensions and quantities, or
9 for substantiating instructions for installation or performance of equipment or systems, all of
10 which remain the responsibility of the contractor as required by the contract documents. The
11 review shall not constitute approval of safety precautions or of construction means, methods,
12 techniques, sequences, or procedures. The engineer's/designer's approval of a specific item
13 shall not indicate approval of an assembly of which the item is a component.
- 14 B. Perform no portion of the work requiring submittal and review of shop drawings, product data, or
15 samples, until the engineer/designer has approved the respective submittal. Such work shall be in
16 accordance with approved submittals.
- 17 C. Submit shop drawings, product data, and samples as a complete set within thirty (30) days of award of
18 contract.
- 19 1. For initial submission and for resubmission required for approval, submit four (4) copies of
20 each item. The engineer/designer will only return two copies. Make reproductions as required
21 for your use and distribution to subcontractors.
- 22 2. Illegible submittals will not be checked by the engineer.
- 23 D. General: Submit the following:
- 24 1. Bill of materials, noting long lead time items
- 25 2. Optical loss budget calculations for each optical fiber run
- 26 3. Project schedule including all major work components that materially affect any other work on
27 the project
- 28 E. Shop drawings: Submit the following:
- 29 1. Backbone (riser) diagrams.
- 30 2. System block diagram, indicating interconnection between system components and
31 subsystems.
- 32 3. Interface requirements, including connector types and pin-outs, to external systems and
33 systems or components not supplied by the contractor.
- 34 4. Fabrication drawings for custom-built equipment.
- 35 F. Product Data -- Provide catalog cut sheets and information for the following:
- 36 1. Wire and cable
- 37 2. Outlets, jacks, faceplates, and connectors
- 38 3. All metallic and nonmetallic raceways, including surface raceways, outlet boxes, and fittings
- 39 4. Terminal blocks and patch panels
- 40 G. Project record drawings:
- 41 1. Submit project record drawings at conclusion of the project and include:
- 42 a. Approved shop drawings
- 43 b. Plan drawings indicating locations and identification of work area outlets, nodes,
44 telecommunications rooms (TRs), and backbone (riser) cable runs
- 45 c. Telecommunications rooms (TRs) and equipment room (ER and/or MC) termination
46 detail sheets.
- 47 d. Cross-connect schedules including entrance point, main cross-connects, intermediate
48 cross-connects, and horizontal cross-connects.

- 1 e. Labeling and administration documentation.
- 2 f. Warranty documents for equipment.
- 3 g. Copper certification test result printouts and diskettes.
- 4 (a.) Optical fiber power meter/light source test results.

5 1.06 QUALITY ASSURANCE

- 6 A. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this
7 type and size.
- 8 B. Upon request by the engineer/designer, furnish a list of references with specific information regarding
9 type of project and involvement in providing of equipment and systems.
- 10 C. Equipment and materials of the type for which there are independent standard testing requirements,
11 listings, and labels, shall be listed and labeled by the independent testing laboratory.
- 12 D. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA -
13 National Electrical Manufacturers Association), this equipment shall be labeled as certified or
14 complying with standards.
- 15 E. Material and equipment shall be new, and conform to grade, quality, and standards specified.
16 Equipment and materials of the same type shall be a product of the same manufacturer throughout.
- 17 F. Subcontractors shall assume all rights and obligations toward the contractor that the contractor
18 assumes toward the owner and engineer/designer.

19 1.07 WARRANTY

- 20 A. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and
21 workmanship for a period of not less than fifteen (15) years from date of acceptance by the owner.
22 The owner shall deem acceptance as beneficial use.
- 23 B. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit
24 these warranties on each item in list form with shop drawings. Detail specific parts within equipment
25 that are subject to separate conditional warranty. Warranty proprietary equipment and systems
26 involved in this contract during the guarantee period. Final payment shall not relieve you of these
27 obligations.

28 1.08 DELIVERY, STORAGE, AND HANDLING

- 29 A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and
30 misalignment. Coordinate with the owner for secure storage of equipment and materials. Do not
31 store equipment where conditions fall outside manufacturer's recommendations for environmental
32 conditions. Do not install damaged equipment; remove from site and replace damaged equipment
33 with new equipment.

34 1.09 SEQUENCE AND SCHEDULING

- 35 A. Submit schedule for installation of equipment and cabling. Indicate delivery, installation, and testing
36 for conformance to specific job completion dates. As a minimum, dates are to be provided for bid
37 award, installation start date, completion of station cabling, completion of riser cabling, completion of
38 testing and labeling, cutover, completion of the final punch list, start of demolition, owner acceptance,
39 and demolition completion.

40 1.10 USE OF THE SITE

- 41 A. The building is currently vacant.
- 42 B. Access to building wherein the work is performed shall be as directed by the owner.

43

1 PART 2 - PRODUCTS

2 2.01 MANUFACTURERS

3 A. Hubbell, Ortronics, Panduit

4 1. Or any other approved equivalent manufacturer that meets the performance requirements of
5 this specification. Category 6 performance is standard.

6 2. Contractor shall be a certified installer.

7 B. Berk-Tek

8 C. Belden

9 D. Mohawk

10 E. Commscope

11 F. Superior Essex

12 G. Optical Cable Corporation

13 2.02 FABRICATION

14 A. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and
15 functional aspects of equipment and its installation.

16 2.03 SUITABILITY

17 A. Provide products that are suitable for intended use, including, but not limited to environmental,
18 regulatory, and electrical.

19 2.04 STATION CABLE

20 A. VOICE TELECOMMUNICATIONS STATION CABLE

21 1. Solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 6 cables with four
22 individually twisted-pairs, which meet or exceed the mechanical and transmission performance
23 specifications in ANSI/TIA/EIA-568-B.2 up to 250 MHz.

24 a. Listed Type CMP (as required in the NEC 2011).

25 B. DATA STATION CABLE (Copper)

26 1. Solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 6 cables with four
27 individually twisted-pairs, which meet or exceed the mechanical and transmission performance
28 specifications in ANSI/TIA/EIA-568-B.2 up to 250 MHz.

29 a. Listed Type CMP (as required in the NEC 2011).

30 2.05 WORK AREA OUTLETS

31 A. VOICE/DATA WORK AREA OUTLETS (Copper only)

32 1. Single-gang stainless steel mounting plate with four (4) openings containing the following
33 devices:

34 a. Voice Outlet - 8-pin modular, Category 6, unkeyed, white, pinned to T568A standards.

35 b. Two Data Outlets - 8-pin modular, Category 6, unkeyed, blue, pinned to T568A
36 standards.

37 2. The device color of outlets and jacket color for cabling that will be used on the project shall be
38 coordinated with the Dane County Information Technology (IT) Department prior to the
39 beginning of any work. It is intended that the Dane County standard being maintained.

40 B. WALL VOICE OUTLETS

41 1. Single-gang stainless steel faceplate with six-conductor jack and wall telephone mounting lugs

- 1 C. DATA ONLY WORK AREA OUTLET
2 1. Single-gang faceplate with 8-pin modular, category 6, unkeyed, blue data jack, pinned to
3 T568A standards
- 4 D. VOICE ONLY WORK AREA OUTLET
5 1. Single-gang faceplate with 8-pin modular, category 6, unkeyed, white telephone jack, pinned
6 to T568A standards
- 7 2.06 PATCH PANELS
- 8 A. 19 in. rack mountable, 24-port 8-pin modular to insulation displacement connector (IDC) meeting
9 Category 6 performance standards, and pinned to T568 A standards. Typical examples of IDC
10 connections are the 110, BIX, and Krone.
- 11 2.07 EQUIPMENT RACKS
- 12 A. Frames, Open, Four Post
- 13 1. Frames shall be manufactured from aluminum and/or steel extrusion and sheet.
- 14 2. Each frame will have two L-shaped top angles, two L-shaped base angles, a top and
15 bottom pan, and four C-shaped equipment-mounting channels (a front and rear pair).
16 The rack will assemble with nut and bolt hardware. The base angles and bottom pan
17 will be pre-punched for attachment to the floor. The top pan will be pre-punched for
18 attaching ladder rack with J-bolts.
- 19 3. Equipment mounting channels will be 3” deep and punched on the front and rear
20 flange with the EIA-310-D Universal hole pattern to provide 45 rack-mount spaces for
21 equipment. Each mounting space will be marked and numbered on the mounting
22 channel.
- 23 4. When assembled with top and bottom pans and angles, equipment-mounting channels
24 will be spaced to allow attachment of 19” EIA rack-mount equipment. Attachment
25 points will be threaded with 12-24 roll-formed threads. The frame will include
26 assembly and equipment-mounting hardware. Frames will include 100 each
27 combination pan head, pilot point, mounting screws.
- 28 5. The assembled frame will measure 7’ (84”) high, 20.3” wide and 41” deep. There will
29 be 29” between the front and rear mounting surfaces of the two pairs of mounting
30 channels. The sides (webs) of the equipment-mounting channels will be punched to
31 allow attachment of vertical cable managers along the sides of the frame or for frame-
32 to-frame or frame-to-rack baying (frames must be able to bay with a 2-post relay
33 rack).
- 34 6. The frame will be rated for 2,000 lb. of equipment.
- 35 7. Finish shall be either clear grained aluminum or epoxy-polyester hybrid powder coat
36 in the color as specified below.
- 37 8. Design Make:
- 38 a. Chatsworth Products, Inc. (CPI),
- 39 b. QuadraRack™ 4-Post Frame
- 40 2.08 FIBER OPTIC PATCH PANEL
- 41 A. Fiber Optic Connector
- 42 1. The Optical Connector shall be LC-type.
- 43 2. The connector ferrule shall be ceramic or glass-in-ceramic. The optical fiber within the
44 connector ferrule shall be secured with an adhesive or mechanical process to prevent pistoning
45 and other movement of the fiber strand.

- 1 3. The use of connector designs that feature a pre-cleaved fiber stub and factory polished
2 connector assembly are acceptable. Acceptable means for mating the cabled fiber with the
3 fiber stub include mechanical and fusion splice methods.
- 4 4. The Connector Body shall be a Composite material.
- 5 5. The attenuation per mated pair shall not exceed the following values:
6 a. Multimode 0.75 dB
7 b. Single-mode 0.75 dB
8 c. Mated pair attenuation shall include in-connector stub splice or splice used to splice
9 pigtail to backbone cable.
10 d. These values shall hold throughout the Cable System. Connectors shall sustain a
11 minimum of 200 mating cycles per EIA/TIA-455-21 without violating specifications.
- 12 6. The connector shall meet the mechanical performance criteria of the applicable EIA/TIA-455
13 Fiber Optic Test Procedures (FOTP).
- 14 7. Color of Connector Body or strain-relief boot LC Connector shall indicate fiber type as
15 follows:
16 a. Multimode (50-micron; LASER-optimized) OM4 – Aqua
- 17 B. Enclosure and Adapter Panels
18 1. All terminated fibers shall be mated to Duplex LC Adapters. Adapters shall be mounted on a
19 panel that, in turn, snaps into the enclosure. The proposed enclosure shall be designed to
20 accommodate a changing variety of connector types.
21 2. Color of Adapter (all except ST-type) shall indicate fiber type as follows:
22 a. Multimode (50-micron; LASER-optimized) OM4 – Aqua
23 3. Fiber Optic Patch Panels shall be rack-mounted.
24 4. Fiber Optic Patch Panel enclosure shall be sized to accommodate the total fiber count to be
25 installed at each location as defined in the specifications and drawings - including those not
26 terminated (if applicable).
27 5. Unit height shall be 2 RU minimum to simplify access.
28 6. Fiber Optic Patch Panel shall be enclosed assemblies affording protection to the cable
29 subassemblies and to the terminated ends. The enclosures shall incorporate a hinged or
30 retractable front cover designed to protect the connector couplings and fiber optic jumpers.
31 7. The patch panel enclosure shall provide for strain relief of incoming cables and shall
32 incorporate radius control mechanisms to limit bending of the fiber to the manufacturer's
33 recommended minimums or 1.2", whichever is larger.
34 8. Access to the inside of the patch panel enclosure during installation shall be from the front
35 and/or rear. Panels that require any disassembly of the cabinet to gain entry will not be
36 accepted.
37 9. All Fiber Optic Patch Panels shall provide protection to both the "facilities" and "user" side of
38 the coupling. The patch panel enclosure shall be configured to require front access only when
39 patching. The incoming cables (e.g. Backbone, Riser, etc.) shall not be accessible from the
40 patching area of the panel. The enclosure shall provide a physical barrier to access of such
41 cables.
42 10. Where termination is to include splicing of factory-terminated cable assemblies, Patch Panel
43 enclosure shall be sized adequately to accommodate the required splice hardware and fiber
44 slack. Alternately, a separate enclosure may be used. The splice hardware shall not be
45 accessible from the "user" side of the enclosure. Refer to Part 3 article "Splicing Procedure –
46 Fiber Optic" for installation and performance requirements.
47

1 PART 3 - EXECUTION

2 3.01 PRE-INSTALLATION SITE SURVEY

- 3 A. Prior to start of systems installation, meet at the project site with the owner's representative and
4 representatives of trades performing related work to coordinate efforts. Review areas of potential
5 interference and resolve conflicts before proceeding with the work. Facilitation with the General
6 Contractor will be necessary to plan the crucial scheduled completions of the equipment room and
7 telecommunications closets.
- 8 B. Examine areas and conditions under which the system is to be installed. Do not proceed with the
9 work until satisfactory conditions have been achieved.
- 10 C. The contractor shall be responsible for meeting with the Owner's (Dane County) Information
11 Technology staff prior to the start of any installation to coordinate the work to be installed as part of
12 this project. It is the design intent to maintain any cabling or installation standards that are currently
13 in use by Dane County.
- 14 1. Failure to perform this meeting may cause work to be removed and reinstalled if not deemed
15 acceptable by Dane County.

16 3.02 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- 17 A. Be responsible for safekeeping of your own and your subcontractors' property, such as equipment and
18 materials, on the job site. The owner assumes no responsibility for protection of above named
19 property against fire, theft, and environmental conditions.

20 3.03 PROTECTION OF OWNER'S FACILITIES

- 21 A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during
22 construction.
- 23 B. Remove protection at completion of the work.

24 3.04 INSTALLATION

- 25 A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed
26 as part of the contract. Store in areas as directed by the owner's representative. Include delivery,
27 unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required,
28 interconnecting wiring of system components, equipment alignment and adjustment, and other related
29 work whether or not expressly defined herein.
- 30 B. Install materials and equipment in accordance with applicable standards, codes, requirements, and
31 recommendations of national, state, and local authorities having jurisdiction, and National Electrical
32 Code® (NEC) and with manufacturer's printed instructions.
- 33 C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and
34 sidewall pressure when installing cables.
- 35 1. Where manufacturer does not provide bending radii information, minimum-bending radius
36 shall be 15 times cable diameter. Arrange and mount equipment and materials in a manner
37 acceptable to the engineer and the owner.
- 38 D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or
39 galvanized rigid conduit (GRC) sleeves and shall be firestopped after installation and testing, utilizing
40 a firestopping assembly approved for that application.
- 41 E. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.
- 42 F. Installation shall conform to the following basic guidelines:
- 43 1. Use of approved wire, cable, and wiring devices
- 44 2. Neat and uncluttered wire termination

- 1 G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches.
2 Support cables installed above removable ceilings.
- 3 H. Install adequate support structures for 10 foot of service slack at each TR.
- 4 I. Support riser cables every three (3) floors and at top of run with cable grips.
5 1. Limit number of four-pair data riser cables per grip to fifty (50)
- 6 J. Install cables in one continuous piece. Splices shall not be allowed except as indicated on the
7 drawings or noted below:
- 8 K. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with
9 power conductors.

10 3.05 GROUNDING

- 11 A. Grounding shall conform to ANSI/TIA/EIA 607(A) - Commercial Building Grounding and Bonding
12 Requirements for Telecommunications, National Electrical Code®, ANSI/NECA/BICSI-568 and
13 manufacturer's grounding requirements as minimum.
- 14 B. Bond and ground equipment racks, housings, messenger cables, and raceways.
- 15 C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground
16 system via #6 AWG green insulated copper grounding conductor.

17 3.06 LABELING

- 18 A. Labeling shall conform to ANSI/TIA/EIA-606(A) standards. In addition, provide the following:
19 1. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.
20 2. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in
21 the following locations:
 - 22 a. Inside receptacle box at the work area.
 - 23 b. Behind the communication closet patch panel or punch block.
 - 24 c. Use labels on face of data patch panels. Provide facility assignment records in a
25 protective cover at each telecommunications closet location that is specific to the
26 facilities terminated therein.
 - 27 d. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-
28 606(A) standard color codes for termination blocks.
 - 29 e. Mount termination blocks on color-coded backboards.
 - 30 f. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
 - 31 g. Label cables, outlets, patch panels, and punch blocks with room number in which
32 outlet is located, followed by a single letter suffix to indicate particular outlet within
33 room, i.e., S2107A, S2107B. Indicate riser cables by an R then pair or cable number.
 - 34 h. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn
35 these drawings over to the owner two (2) weeks prior to move in to allow the owner's
36 personnel to connect and test owner-provided equipment in a timely fashion.
 - 37 i. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks
38 of acceptance of project by the owner. A set of as-built drawings shall be provided to
39 the owner in magnetic media form (3.5" floppy disks) and utilizing CAD software that
40 is acceptable to the owner. The magnetic media shall be delivered to the owner within
41 six (6) weeks of acceptance of project by owner.

42 3.07 TESTING

- 43 A. Testing shall conform to ANSI/TIA/EIA-568-B.1 standard. Testing shall be accomplished using level
44 IIe or higher field testers.
45

- 1 B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct
 2 grounded, and reversed pairs. Examine open and shorted pairs to determine if problem is caused by
 3 improper termination. If termination is proper, tag bad pairs at both ends and note on termination
 4 sheets.
- 5 1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA-568-B.1 requirements.

6
 7 **Category 6 Test Parameters:**
 8

Frequency Mhz	TIA/EIA 568B.2-1 Insertion Loss Attenuation Max. dB	TIA/EIA 568B.2-1 NEXT Worst Pair to Pair dB	Category 6 Cable Permanent Link Test		TIA/EIA 568B.2-1 PSELFEXT Loss dB	TIA/EIA 568B.2-1 Return Loss dB
			TIA/EIA 568B.2-1 PSNEXT Worst Case Loss dB	TIA/EIA 568B.2-1 ELFEXT Worst Pair to Pair Loss DB		
1.00	1.9	65.0	62.0	64.2	61.2	19.1
4.00	3.5	64.1	61.8	52.1	49.1	21.0
8.00	5.0	59.4	57.0	46.1	43.1	21.0
10.00	5.5	57.8	55.5	44.2	41.2	21.0
16.00	7.0	54.6	52.2	40.1	37.1	20.0
20.00	7.9	53.1	50.7	38.2	35.2	19.5
25.00	8.9	51.5	49.1	36.2	33.2	19.0
31.25	10.0	50.0	47.5	34.3	31.3	18.5
62.50	14.4	45.1	42.7	28.3	25.3	16.0
100.00	18.6	41.8	39.3	24.2	21.2	14.0
200.00	27.4	36.9	34.3	18.2	15.2	11.0
250.00	31.1	35.3	32.7	16.2	13.2	10.0

- 9
- 10 C. Propagation Delay
- 11 1. The maximum propagation delay determined in accordance with the ANSI/TIA/EIA –568B.2
 12 for a Permanent Link configuration shall be less than 498-ns measured at 10MHz. (Note: In
 13 determining the permanent link propagation delay, the propagation delay contribution of
 14 connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 250MHz).
- 15 D. Delay Skew
- 16 1. For all frequencies from 1 MHz to 250 MHz, Category 6 cable propagation delay skew shall
 17 not exceed 44ns/100m at 20 degrees C, 40 degrees C, and 60 degrees C. In addition, the
 18 propagation delay skew between all pairs shall not vary more than +/- 10ns from the measured
 19 value at 20 degrees C when measured at 40 degrees C and 60 degrees C. Compliance shall be
 20 determined using a minimum 100m of cable.
- 21 E. In order to establish testing baselines, cable samples of known length and of the cable type and lot
 22 installed shall be tested. The cable may be terminated with an 8-position Category 6 Modular plug (8-
 23 pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be
 24 calculated based on this test and be utilized during the testing of the installed cable plant. This
 25 requirement can be waived if NPV data is available from the cable manufacturer for the exact cable
 26 type under test.
- 27 F. In the event results of the tests are not satisfactory, the Contractor shall make adjustments,
 28 replacement and changes as are necessary, and shall then repeat the test or tests which disclosed faulty
 29 or defective material, equipment or installation method, and shall make additional tests as the
 30 Engineer deems necessary at no additional expense to the project or user agency.
- 31 G. Where any portion of system does not meet the specifications, correct deviation and repeat applicable
 32 testing at no additional cost to the owner.
 33

1 3.08 FIELD QUALITY CONTROL

- 2 A. Employ job superintendent or project manager during the course of the installation to provide
3 coordination of work of this specification and of other trades, and provide technical information when
4 requested by other trades. This person shall maintain current RCDD® (Registered Communications
5 Distribution Designer) registration and shall be responsible for quality control during installation,
6 equipment set-up, and testing.
- 7 B. At least 30 percent of installation personnel shall be BICSI Registered Telecommunications Installers.
8 Of that number, at least 15 percent shall be registered at the Technician Level, at least 40 percent shall
9 be registered at the Installer Level 2, and the balance shall be registered at the Installer Level 1.
- 10 C. Installation personnel shall meet manufacturer's training and education requirements for
11 implementation of extended warranty program.

12
13 END OF SECTION 27 10 00
14
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SECTION DIVISION 28 13 00

ACCESS CONTROL AND INTRUSION DETECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.
- B. A complete access control system shall be provided per specifications found under Division 28 (Access Control) and Division 25 (Integrated Automation).
- C. The Division 28 Access Control System Peripheral Device (ACS-PD) Contractor shall provide all peripheral devices (PD) including but not limited to; electronic locking hardware (EL), door status sensors (DSS), proximity card readers (PCR), request to exit devices (REX), emergency door releases (EDR), fire alarm system interface (FASI), surge suppressors (SS), power supplies (PS), back up batteries (Batt), sub system interfaces (SSI) including but not limited to fire alarm systems, cable, cable support and labor for; mounting all enclosures/devices (including Division 25 enclosures), installation of all cabling, termination of all devices (including Division 25 devices) and 120VAC power installation as needed.
- D. The Division 25 contractor shall provide all access control modules, access control module enclosures, access control system management software, access credentials, system programming and training under subcontract to the Division 28 contractor.
- E. Both Division 28 and Division 25 contractors shall be responsible and present for a complete point to point checkout and commissioning of the system.
- F. All labor, material and equipment not specifically referred to herein or on the plans, that are required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.
- G. Installation of all devices and components shall be in compliance with and conform to NFPA 70, NFPA 101 and NFPA 731.

1.02 SYSTEM DESCRIPTION

- A. The Access Control System (ACS) shall be comprised of; master access control modules (ACM) with network connectivity; two door expansion units (ACEM) connected to master control modules via an RS-485 and power trunk; card readers, door status devices, request to exit devices, emergency door releases and electronic locking hardware that in turn are connected to either master access control modules or expansion modules; panic buttons, power supplies and back up batteries which support the electronic locking hardware as required.
- B. The ACS-PD Contractor shall include all Ethernet network wiring required to create a control LAN/WAN that shall connect all ACMs, operator workstations, servers, routers, switches and other network devices as indicated on the riser diagram. The ACS-PD Contractor shall not connect to a customer provided LAN/WAN.

1 1.03 CONTRACTOR QUALIFICATIONS

2 A. General:

- 3 1. The ACS-PD Contractor shall have a successful history in the design and installation of access
4 control systems based wide area network connectivity and shall provide evidence of this
5 history as a condition of acceptance of bid.
- 6 2. The ACS-PD Contractor shall have an office that is staffed with trained engineers and
7 technicians fully capable of providing instruction and routine emergency maintenance service
8 on all peripheral system components within 24 hours of notification.
- 9 3. Contractor Service:
- 10 a. ACS-PD Contractor shall have a local service facility within a 90-mile radius of the job
11 site, staffed with qualified service personnel, fully capable of providing instructions and
12 routine or emergency maintenance service.
- 13 b. Experience (Submit the following information as part of the proposal package):
- 14 i. Submit a list of no less than five similar projects that have access control
15 systems devices installed by the ACS-PD Contractor. Include proper references
16 and contact numbers.
- 17 c. Submit an organizational diagram indicating the key technical staff proposed for the
18 project including Project Manager, Application Engineer, etc.

19 1.04 SPECIFICATION NOMENCLATURE

20 A. Acronyms used in this specification are as follows:

- 21 1. ACS Access Control System
- 22 2. ACM Access Control Module
- 23 3. ACEM Access Control Expansion Module
- 24 4. ACS-PD Access Control System-Peripheral Device
- 25 5. AWG American Wire Gauge
- 26 6. BAS Building Automation System
- 27 7. DSS Door Status Sensor
- 28 8. EDR Emergency Door Release
- 29 9. EL Electronic Locking Hardware
- 30 10. FASI Fire Alarm System Interface
- 31 11. IACS Integrated Access Control System
- 32 12. IOM Input/Output Module
- 33 13. LAN Local Area Network
- 34 14. PCR Proximity Card Reader
- 35 15. PD Peripheral Device
- 36 16. PR Proximity Card Reader
- 37 17. PS Power Supply
- 38 18. REX Request to Exit Device
- 39 19. SSI Sub System Interface
- 40 20. WAN Wide Area Network

41 1.05 DIVISION OF WORK

- 42 A. The ACS-PD Contractor shall be responsible for all input/output wiring, power wiring (120VAC),
43 interlock/safety wiring and Ethernet LAN/WAN wiring, where applicable to all peripheral devices
44 and Division 25 enclosures.

- 1 B. The ACS-PD Contractor shall be responsible for the installation and mounting of all ACS peripheral
2 devices, cabling, cabling support and Division 25 enclosures.
- 3 C. The Division 25 System Integrator shall be responsible for providing the ACMs and ACEMs to which
4 all peripheral devices shall be connected, servers, software, programming of the ACMs/ACEMs,
5 global supervisory control applications and system integration.

6 1.06 RELATED WORK SPECIFIED ELSEWHERE

- 7 A. Section 25 00 00:
- 8 1. Providing Access Control Modules
 - 9 2. Providing Access Control Expansion Modules
 - 10 3. Providing Access Control Software
 - 11 4. Providing I/O Expansion Modules
 - 12 5. Global supervisory control sequences
 - 13 6. Integration of owner's existing control system (if applicable)
- 14

15 1.07 DELIVERY, STORAGE AND HANDLING

- 16 A. Provide factory-shipping cartons for each piece of equipment and peripheral device. Maintain cartons
17 through shipping, storage, and handling as required to prevent equipment damage. Store equipment
18 and materials inside and protected from weather.

19 1.08 JOB CONDITIONS

- 20 A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to
21 insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's
22 responsibility to check the Contract Documents for possible conflicts between his Work and that of
23 other crafts in equipment location, structural and architectural features and compatibility between
24 systems, equipment and components.

25 1.09 SUBMITTAL

- 26 A. Eight copies of shop drawings of the entire control system shall be submitted and shall consist of a
27 complete list of equipment and materials, including manufacturers catalog data sheets and installation
28 instructions. Shop drawings shall also contain complete wiring and schematic diagrams, calculations,
29 and any other details required to demonstrate that the system has been coordinated and will properly
30 function as a system.
- 31 B. The ACS-PD Contractor shall provide catalog data sheets and wiring diagrams to the Section 25
32 System Integrator for proper coordination of work.
- 33 C. Upon completion of the work, provide a complete set of 'as-built' drawings on compact disk.
34 Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built'
35 drawings shall be provided in addition to the documents on magnetic floppy disk media or compact
36 disk.
37

38 PART 2 - MATERIALS

39 2.01 GENERAL

- 40 A. The Access Control System Peripheral Devices (ACS-PD) shall include but not limited to; electronic
41 locking hardware (EL), door status sensors (DSS), panic buttons (PB), proximity card readers (PCR),
42 request to exit devices (REX), emergency door releases (EDR), fire alarm system interface (FASI),
43 surge suppressors (SS), power supplies (PS), back up batteries (Batt), cable, cable support and labor
44 for; mounting all enclosures/devices (including Division 25 enclosures), installation of all cabling,
45 termination of all devices (including Division 25 devices) and 120VAC power installation as needed.

- 1 2.02 Proximity Card Readers (PCR)
- 2 A. All card readers shall be HID Corporation 125kHz proximity type - (no substitutes).
- 3 1. One gang - ThinLine II style (1G) shall be 53695CG100.
- 4 2. Mullion style - MiniProx (M) shall be 5365EGT00 or 5365EGP00.
- 5 3. Small platform – ProxPoint Plus (SP)
- 6 B. The mounting height of all proximity card readers shall fall within ADA guidelines.
- 7 2.03 Door Status Sensor (DSS)
- 8 A. Door status sensors shall be either integral to the electronic locking hardware (latch bolt monitoring –
- 9 LBM) or through stand-alone devices (magnetic contacts).
- 10 B. All stand-alone door status sensors shall be of the magnetic reed type and obtained from GE Security
- 11 or approved equal.
- 12 1. 1” Diameter Steel Door Recessed Sensor (DPDT): 1076D
- 13 2. 1” Diameter Steel Door Recessed Sensor (N/O): 1078W
- 14 3. ¾” Diameter Steel Door Recessed Sensor (N/O): 1078C
- 15 4. Press fit rare earth magnet: 1840-N
- 16 5. Roller Plunger (hinge side of door only – N/O): 3008
- 17 *Use only where a recessed sensor will not function properly. Prior approval must be obtained*
- 18 *before installation.*
- 19 6. Commercial Steel Door Surface mounted Sensor (N/O): 1045
- 20 *Use only where a recessed sensor will not function properly. Prior approval must be obtained*
- 21 *before installation.*
- 22 C. Sensors of the recessed type shall adhere to the following installation standards:
- 23 1. When installed at the top of the door the sensor shall not be installed no closer than 2” and no
- 24 further than 10” from the latch side of the door.
- 25 2. When installed on the latch side surface of the door the sensor shall not be installed closer than
- 26 2” of either the bottom or top of the door.
- 27 3. When a recessed sensor is utilized at the top of an aluminum door where the door has a
- 28 recessed channel an 1840-N or similar magnet shall be used. The construction of field
- 29 expedient assemblies to utilize a standard press fit magnet will not be allowed.
- 30 D. Sensors of the plunger type shall adhere to the following installation standards:
- 31 1. A plunger sensor shall only be used when a recessed sensor cannot be utilized on the latch side
- 32 or top of a door.
- 33 2. Plunger sensors shall only be used on the hinge side of a door.
- 34 3. A plunger sensor shall be installed no closer than 2” from the bottom or top of the door.
- 35 4. A plunger sensor shall have sufficient spacers applied to cause the switch to operate when the
- 36 door has moved no further than 5” from the closed position.
- 37 E. Sensor of the surface mount type shall adhere to the following installation standards:
- 38 1. A surface mounted switch shall be installed no closer than 1” and no further than 3” from the
- 39 latch side of the door.
- 40 2. Armored cable shall be installed to protect the integrity of the cable where accessible by
- 41 human or mechanical contact.
- 42 F. All door status sensors shall have an end of line supervision device installed at the device within 12”
- 43 of the sensor. The end of line supervision device shall be provided to the ACS-PD Contractor by the
- 44 Division 25 Contractor.
- 45

- 1 2.04 Request to Exit Device (REX)
- 2 A. Request to exit devices, when applicable, may be indicated on the drawings as either motion (REX-
- 3 M), wireless (REX-WL), button (REX-B) or integral to the electrified lockset (REX-INT).
- 4 1. Passive Infrared Motion (REX-M): Bosch DS150i/DS151i or approved equal.
- 5 2. Wireless (REX-W): Linear DXR-71 or DXR-702 (Receivers), DXT-41, DXT-42 or DXT-21
- 6 (Transmitters) or approved equal.
- 7 3. Button (REX-B): Momentary push button, SPDT, 4amps @ 28VDC or equal. Unit shall
- 8 include a mountable enclosure to support wiring terminations.
- 9 4. Integral to Lockset (REX-INT): specific to electronic locking hardware.
- 10 B. All RTE devices shall be electronically wired as normally open circuits (NO) to allow for T-Tapping
- 11 or parallel circuit connections for multiple REX devices on a single door.
- 12 2.05 Emergency Door Release (EDR)
- 13 A. Emergency door release devices, if applicable, shall be of either the manual pull station (EDR-MP) or
- 14 pneumatic time delay (EDR-P) type.
- 15 1. Manual Pull Station (EDR-MP): Security Door Controls 492 or approved equal.
- 16 2. Pneumatic Time Delay (EDR-P): Alarm Controls Corporation TS-14 or approved equal.
- 17 2.06 Electronic Locking Hardware (EL)
- 18 A. Electronic locking hardware shall operate on 24 VDC unless otherwise noted.
- 19 B. Electronic strikes, electrified locksets or electrified crash bars are the preferred technologies for
- 20 electronic locking hardware. Magnet locks are not the preferred method and will require written
- 21 approval prior to installation.
- 22 C. Electronic locking hardware shall meet ANSI/BHMA Grade 1 standards.
- 23 D. Magnetic locking hardware, when approved, shall support a holding force of between 1,650 and 2,700
- 24 pounds.
- 25 E. Electronic locking hardware applied to fire rated door assemblies shall be listed for the intended use.
- 26 Electronic locking hardware for use with fire rated door assemblies shall be UL 10C, NFPA-252 and
- 27 ASTM-E 2074 listed.
- 28 2.07 Surge Suppressor (SS)
- 29 A. Surge suppression shall be provided between each electrified locking hardware device and the access
- 30 control system controlling relay/power source. One suppressor shall be installed at the electronic
- 31 locking hardware and one at the power source controlling relay.
- 32 1. Capacitor/Transzorb (DC power): Honeywell NC-S4, Diteck DTK-ESS or approved equal.
- 33 B. Where system devices are susceptible to power surges or stray voltages additional surge suppression
- 34 shall be provided. Examples include but are not limited to card readers located at parking gates or
- 35 stand-alone sheds.
- 36 1. Card Reader Surge Suppressor: Diteck DTK-4LVLP-CR or approved equal.
- 37 2. Door Status Sensor: Diteck DTK-2MHLP series or approved equal.
- 38 3. Request to Exit Device: Diteck DTK-2MHLP series or approved equal.
- 39

- 1 2.08 Panic Button (PB)
- 2 A. Provide Alarm Controls Corporation Model TS-18 mounted under desks as directed.
- 3 B. When activated, system to send text or email to designated cell phone equipped to receive this
- 4 message.
- 5 2.09 Power Supply (PS)
- 6 A. Power supplies for electronic locking hardware shall be either wall mount or rack mount units
- 7 depending on the application and available mounting source. Wall wart transformers shall not be
- 8 allowed for either direct power to field devices or to a power supply distribution panel. Direct,
- 9 hardwired 120VAC to open frame or like transformer mounted in an enclosure is the preferred
- 10 method. Line cord connections to a duplex or like outlet for rack mount power supplies shall be
- 11 deemed acceptable.
- 12 B. Power supplies shall provide back-up battery power sufficient to operate the system components for a
- 13 minimum of 4 hours. The use of a UPS for rack mount power supplies is preferred over a separate
- 14 rack mounted battery enclosure.
- 15 2.10 Backup Batteries (Batt)
- 16 A. Backup battery power shall be provided for all system components such that the entire system will
- 17 function normally for a period of no less than 4 hours from the loss of AC power.
- 18 2.11 Access Cards
- 19 A. Provide (100) access cards.
- 20 2.12 Cabling
- 21 A. All cabling shall be rated for the intended use and follows local, State of Wisconsin and National
- 22 Electrical Code standards.
- 23 B. All cabling shall be supported in a manner which meets local, State of Wisconsin and National
- 24 Electrical Code Standards.
- 25 C. Component cabling for the following devices shall meet the following the gauge, type and conductor
- 26 count minimums:
- 27 1. Card Reader – 6 conductor 20AWG stranded shielded
- 28 2. Request to Exit Device – 4 conductor 20AWG stranded
- 29 3. Door Status Device – 2 conductor 22AWG stranded
- 30 4. Electronic Locking Hardware – 2 conductor 18AWG stranded
- 31 5. Emergency Door Release – 2 conductor 18AWG stranded
- 32 6. RS-485 Data between ACM and ACEM – twisted pair 24AWG shielded - no more than
- 33 12.5pF
- 34 7. Power between ACM and ACEM – 4 conductor 18AWG stranded shielded
- 35 D. It is the responsibility of the ACS-PD Contractor to calculate the electrical load for each circuit and
- 36 size the cabling conductors appropriately to facilitate a fully functioning system.
- 37 E. All cables are to be PLENUM and may be installed free-air.
- 38

39 PART 3 - EXECUTION

40 3.01 INSTALLATION

- 41 A. All work described in this section shall be installed, wired and circuit tested by factory certified
- 42 technicians qualified for this work. The installing office shall have a minimum of five years of
- 43 installation experience with the manufacturer and shall provide documentation in submittal package

1 verifying longevity of the installing company's relationship with the manufacturer. Supervision and
2 checkout of the system shall be by the employees of the local contracting field office (branch or
3 representative).

4 Install system and materials in accordance with manufacturer's instructions and as detailed on the
5 project drawing set.

6 C. Drawings of access control system components are diagrammatic only and any apparatus not shown,
7 such as relays, accessories, etc., but required to make the system operative to the complete satisfaction
8 of the Engineer and Owner shall be furnished and installed without additional cost.

9 D. Line and low voltage electrical connections to system devices specified or shown on the control
10 diagrams shall be furnished and installed by the ACS-PD Contractor in accordance with these
11 specifications.

12 E. All electrical control wiring and power wiring to the control panels shall be the responsibility of the
13 ACS-PD Contractor.

14 F. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National
15 Electrical Code and any applicable local or state codes. All access control system wiring shall be
16 installed in the conduit types specified in the Project Electrical Specifications (Division 26) unless
17 otherwise allowed by the National Electrical Code or applicable local codes. Where plenum rated
18 cable wiring is required, it shall be run parallel to or at right angles to the structure, properly
19 supported and installed in a neat and workmanlike manner.

20 G. Any devices, such as door status contacts and electronic locking hardware, which are applied to fire
21 rated door assemblies shall be installed in a manner which maintains the fire rating of the assembly.
22 All penetrations to the fire door assembly must conform with the manufacturer's specifications and
23 local building code. The installing contractor shall provide documentation indicating the fire rating of
24 the assembly has been maintained and is in conformance with local building code.

25 3.02 WIRING

26 A. GENERAL REQUIREMENTS

27 1. Install low voltage power and access system component wiring in conduit in the following
28 locations regardless of local building code allowances.

- 29 a. Mechanical rooms.
- 30 b. Electrical rooms.
- 31 c. Vertical risers (exception: fire rated continuous closet like a telephone closet).
- 32 d. Open Areas where the wiring will be exposed to view or tampering.

33 2. Conceal conduit within finished shafts, ceilings and wall as required. Install exposed conduit
34 parallel with or at right angles to the building walls

35 3. Tag all equipment, panels, cables, conduits, junction boxes, etc., as called out in the
36 "Identification" section of this specification and as shown on the drawings. Where
37 identification is not provided on the drawings the ACS-PD Contractor shall provide, at a
38 minimum, identification tags on all cabling at both ends of the cable and shall provide
39 documentation of the cable tag numbering with description of the cable use in a spread sheet
40 format.

41 4. Perform installation of all devices in the manner specified by each manufacturer. Aside from
42 product submittal requirements, provide manufacturer's installation instructions for
43 verification when requested.

44 5. Where Class 2 wires are in concealed and accessible locations including ceiling return air
45 plenums, approved cables not in raceway may be used provided that:

- 46 a. Circuits meet NEC Class 2 (current-limited) requirements. (Low-voltage power
47 circuits shall be sub-fused when required to meet Class 2 current-limit.)
 - 48 b. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be
49 UL listed specifically for that purpose.
- 50

- 1 6. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels
2 containing high voltage may not be used for low voltage wiring except for the purpose of
3 interfacing the two (e.g., relays and transformers).
- 4 7. Where Class 2 wiring is run exposed, wiring to be run parallel along a surface or perpendicular
5 to it, and NEATLY tied at 3m intervals.
- 6 8. All wire-to-device connections shall be made at a terminal block, terminal strip or with a
7 crimped connector where the device has a wiring harness. All wire-to-wire connections shall
8 be at a terminal block or with a crimped connector. All wiring within enclosures shall be
9 neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- 10 9. All unused conductors shall be capped by use of a crimp connector or wire nut.
- 11 10. Tighten electrical connectors and terminals according to manufacturer's published torque-
12 tightening values. If manufacturer's torque values are not indicated, use those specified in
13 UL 486A and UL 486B.

14 **B. ETHERNET Network Requirements**

- 15 1. Wired network communication shall be via channels consisting of Category 5E or Category 6
16 network cable.
- 17 2. Communication conduits or cabling shall not be installed closer than 2m from high power
18 transformers or run parallel within six feet of electrical high power cables. Care shall be taken
19 to route the cable as far from interference generating devices as possible.
- 20 3. Ethernet network wiring shall be installed as shown on riser diagram.
- 21 4. There shall be no power wiring, in excess of 30 VAC rms, run in conduit with communications
22 wiring.
- 23 5. Recommended CAT 5E and CAT 6 Ethernet wiring guidelines shall be followed and in no
24 case shall the distance between any Ethernet switch, NAC or other Ethernet LAN device
25 exceed 100 meters.
- 26 6. Ethernet wiring shall be installed and rated for communications to 1 GB.

27 **C. CONDUIT AND FITTINGS**

- 28 1. Conduit for Control Wiring, Control Cable and Transmission Cable: Electrical metallic tubing
29 (EMT) with compression fittings, cold rolled steel, zinc coated or zinc-coated rigid steel with
30 threaded connections.
- 31 2. Outlet Boxes (Dry Location): Galvanized drawn steel suited to each application, in general,
32 four inches square or octagon with suitable raised cover.
- 33 3. Outlet Boxes (Exposed to Weather): Threaded hub cast aluminum or iron boxes with gasket
34 device plate.
- 35 4. Pull and Junction Boxes: Size according to number, size, and position of entering raceway as
36 required by National Electrical Codes. Enclosure type shall be suited to location.
- 37 5. Plug or cap all unused conduit openings and stub-ups. Do not use caulking compound.
- 38 6. Route all conduit to clear beams, plates, footings and structure members. Do not route conduit
39 through column footings or grade beams.
- 40 7. Set conduits as follows:
 - 41 a. Expanding silicone firestop material where conduit is run between floors and through
42 walls of fireproof shaft.
 - 43 b. Oakum and lead, sealed watertight penetration through outside foundation walls.
- 44 8. Cap open ends of conduits until conductors are installed.
- 45 9. Where conduit is attached to vibrating or rotating equipment, flexible metal conduit with a
46 minimum length of 18 inches and maximum length of 36 inches shall be installed and
47 anchored in such a manner that vibration and equipment noise will not be transmitted to the
48 rigid conduit.

1 10. Where exposed to the elements or in damp or wet locations, waterproof flexible conduit shall
2 be installed. Installation shall be as specified for flexible metal conduit.

3 11. Provide floor, wall, and ceiling plates for all conduits passing through walls, floors or ceilings.
4 Use prime coated cast iron, split-ring type plates, except with polished chrome-plated finish in
5 exposed finished spaces.

6 D. IDENTIFICATION

7 1. Wire Tags

8 a. All multi-conductor cables, including those for all I/O devices, in all pull boxes and
9 terminal strip cabinets shall be uniquely tagged at both ends. Keep a catalog of wire
10 identification in electronic spread sheet form for submittal to the owner at the project's
11 completion.

12 b. Provide wire Tags as per Division 26.

13 2. Conduit Tags

14 a. Provide tagging or labeling of conduit so that it is always readily observable which
15 conduit was installed or used in implementation of this Work.

16 3.03 WARRANTY

17 A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of
18 one year from the time of system acceptance.

19 B. Within this period, upon notice by the Owner, any defects in the work provided under this section due
20 to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after
21 receipt of notice) repaired or replaced by the ACS-PD Contractor at no expense to the Owner.

22 3.04 START-UP AND TESTING

23 A. It is the responsibility of the ACS-PD contractor to ensure the proper installation and performance of
24 the peripheral devices as specified in this section and to coordinate the start-up and testing of the
25 access control system with the Division 25 System Integrator to ensure the networks and attached
26 devices are functioning properly. Once all devices are installed, programmed, configured and
27 powered, the ACS-PD contractor shall notify the Division 25 System Integrator to schedule a start-up
28 plan. During the start-up, all devices supplied by the ACS-PD contractor shall be checked for proper
29 communication and function, network connectivity as may be required and network traffic to ensure
30 proper performance. The ACS-PD contractor shall correct any devices or performance found to be
31 defective.

32 B. The system tests, conducted jointly by the ACS-PD contractor and the Division 25 System Integrator,
33 shall provide the following:

34 1. Complete end-to-end test and verification for each connected input and output. This includes
35 verification of all point data in graphic displays as may be required and if applicable.

36 2. Complete functional test of sequences of operation including global control sequences.

37 3.05 ACCEPTANCE TESTING

38 A. The ACS-PD Contractor shall verify that all peripheral devices are ready for operation. This
39 inspection shall verify that the following items have been properly installed.

40 1. Network connections.

41 2. Power connections.

42 3. Proper power supply voltage and types.

43 4. Electrical installation conforms to local code authorities.

44 5. Point to point check of all digital I/O for continuity and correct execution of the functional
45 operation.
46

- 1 B. Submit an Inspection Log, which enumerates the above in a check list form for all devices. Indicate
2 corrective action for non-conforming or defective products and/or product installations.
- 3 C. The ACS-PD Contractor shall perform all necessary testing, de-bugging and perform all required
4 operational checks to insure that the system is functioning in full accordance with these specifications.
5 The ACS-PD and Division 25 contractor are to coordinate the checkout of the system such that each
6 Division has a representative present during the entire system checkout.
- 7 D. The ACS-PD Contractor shall perform tests to verify proper performance of components and
8 sequences of operation. Repeat tests until proper performance results are obtained. This testing shall
9 include a point-by-point log to validate 100% of the input and output points of the IACS operation.
10 The Division 25 System Integrator shall have a representative present during system checkout by the
11 ACS-PD Contractor.
- 12 E. Upon completion of the performance tests described above, repeat these tests, point by point as
13 described in the validation log above in presence of Owner's Representative, as required. Properly
14 schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not
15 delay tests so as to prevent delay of occupancy permits or building occupancy.
- 16 F. System Acceptance: Satisfactory completion is when the ACS-PD contractor has successfully
17 performed all the required testing to show performance compliance with the requirements of the
18 Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be
19 contingent upon completion and review of all corrected deficiencies.
- 20 G. In conjunction with the work of other trades, thoroughly test all equipment and systems in a dynamic
21 mode simulating all operating sequences including safety unlocks and emergency fire mode where
22 required.

23 3.06 WARRANTY ACCESS

- 24 A. The Owner shall grant the ACS-PD Contractor reasonable access to the ACS during the warranty
25 period.

26 3.07 TRAINING

- 27 A. Training on the ACS shall be the responsibility of the Division 25 contractor.

28 3.08 PROGRAMMED DOOR AUTO UNLOCK ON TIME SCHEDULE:

- 29 A. The IACS shall automatically initiate an unlocked condition for the assigned doors based on a time
30 schedule to be determined by the customer.

31
32
33
34
35

END OF SECTION 28 13 00

SECTION 28 31 00
FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract and portions of Division One of this Project Manual apply to this Section as though repeated herein.

1.2 SYSTEM DESCRIPTION

- A. Extend the existing EST, Non-coded, UL Listed intelligent analog addressable system.

1.3 BUILDING CODES and STANDARDS

- A. National Fire Protection Association (NFPA):
 - 1. NFPA-70 National Electrical Code (NEC)
 - 2. NFPA-72 National Fire Alarm Code
 - 3. NFPA 101 Life Safety Code
 - 4. IBC International Building Code
 - 5. IFC International Fire Code
 - 6. IMC International Mechanical Code
- B. National Electrical Manufacture's Association (NEMA)
- C. Underwriters Laboratories, Inc. (UL)
 - 1. UL-864 Control Units for Fire Protective Signaling Systems (9th Edition)
 - 2. UL-268 Smoke Detector for Fire Protective Signaling Systems
 - 3. UL-217 Smoke Detectors for Single and Multiple Station
 - 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
 - 9. UL 2017 Standard for General-Purpose Signaling Devices and Systems
 - 10. UL 2572 Control and Communication Units for Mass Notification Systems

1.4 SUBMITTALS

- A. The Contractor shall not purchase any equipment for the system specified herein until the Owner has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The Contractor shall submit three (3) complete sets of documentation within 30 calendar days after award of purchase order.
- B. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the Contract Documents. In addition the Contractor shall provide specific notation on each Shop Drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.
1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to the Architect.
 2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level IV minimum or Wisconsin registered Professional Engineer.
- C. Product Data: Product Data sheets with the printed logo or trademark of the manufacturer of all equipment. Indicated in the documentation shall be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Owner.
- D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72.
 2. Include voltage drop calculations for notification appliance circuits based on manufacturer-provided panel start voltage and lump-sum method calculation. Point-to-point notification appliance circuit calculations are not acceptable.
 3. Include battery-size calculations. Batteries shall be upsized 25% from minimum requirements derived from calculations.
 4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturers written recommendations.
 6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
 7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits from end-to-end. "Home Run" indicators or other non end-to-end wire path designations are not acceptable.

- E. Operation and Maintenance Data: For fire-alarm systems and components to be included in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data, include the following:
1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
 2. Provide "Record of Completion Documents" according to NFPA72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
 3. Record copy of site-specific software database file, hardcopy printout and CD, with password for delivery to the owner. Proprietary system/service companies will not be acceptable.
 4. Provide "Maintenance, Inspection and Testing Records" according to NFPA72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals (hardcopy) and electronic on CD.
 5. Manufacturer's required maintenance related to system warranty requirements.
 6. Abbreviated operating instructions for mounting at fire-alarm control unit.
- F. Software and Firmware Operational Documentation:
1. CD of site-specific software database file with password, all product data sheets and AutoCAD 2016 files. Provide hard copy printout of the software program. Proprietary system/service companies will not be acceptable.
 2. Provide a list of global system settings
 3. Provide a list of the contents of each system cabinet and their settings
 4. Provide a list of all addressable devices with their addresses and settings

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire alarm Level II technicians.
- C. Project Manager Qualifications: Installation shall be supervised by personnel certified by NICET as fire alarm Level IV technicians.
- D. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.
- F. NFPA Certification: Obtain certification according to NFPA72 in the form of a placard by an approved alarm company.

1.6 WARRANTY AND SOFTWARE SERVICE AGREEMENT

- A. The contractor shall warranty all materials, installation and workmanship for one (1) year from date of acceptance, unless otherwise specified. A copy of the manufacturers' warranty shall be provided with closeout documentation and included with the operation and installation manuals.
- B. The System Supplier shall maintain a service organization with adequate spare parts stocked within 90 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the Owner notifying the contractor.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Provide quantity equal to 2% percent of amount of each type installed, but no fewer than 2 unit of each type.
 - a. Smoke Detectors, heat detectors, manual pull stations, duct smoke detector, monitor modules and control modules:
 - b. Notification appliances; speakers, speaker-strobes and strobes.
 - 2. Keys: Ten extra set for access to locked and tamperproof components.
 - 3. All spare part shall be housed in metal cabinet labeled "Fire Alarm Spare Parts".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. EST only to match existing fire alarm control panel.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Flame detectors.
 - 4. Smoke detectors.
 - 5. Duct smoke detectors.
 - 6. Verified automatic alarm operation of smoke detectors.
 - 7. Automatic sprinkler system water flow.
 - 8. Fire-extinguishing system operation.
 - 9. Fire standpipe system.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Activate audible appliances.

2. Continuously operate the visual notification appliances.
3. Identify alarm at fire-alarm control unit and remote annunciators.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Unlock electric door locks in designated egress paths.
6. Release fire and smoke doors held open by magnetic door holders.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
8. Send text messages to designated cell phones through an interface with the Johnson Controls Building Automation System. Provide everything necessary to interface with the Johnson Controls Gateway.
9. Record events in the system memory.
10. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging circuitry
8. High or low battery charge.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Fire-pump power failure, including a dead-phase or phase-reversal condition.
11. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.3 FIRE-ALARM CONTROL UNIT

A. The existing fire alarm control panel is an EST2.

2.4 REMOTE ANNUNCIATOR

- A. Annunciator shall match those of fire-alarm control unit LCD display functions for alarm, supervisory, monitor and trouble indications and common system controls including; acknowledging, silencing, resetting, and testing. The fire alarm bypass function switches and LCD Keypad may be housed separately in a locked enclosure to prevent unauthorized use and control of fire alarm system program control and bypass. The Contractor shall verify this feature with Owner prior to final commissioning.
 - 1. This display shall be EST, model 3-LCDXL1 or 3-LCDANN and shall have the following minimum features:
 - a. LCD Display
 - b. System Bypass Switches

2.5 NAC POWER SUPPLY

- A. The NAC power supply shall be independent unit that will provide power to visual strobe notification appliances. It shall be possible to configure the NAC's to follow the main panel's NAC or activate from intelligent synchronized modules. The booster NAC's must be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. Fault conditions on the power supply shall not impede alarm activation of host NAC circuits or other power supplies. The NAC power supply must be able to provide concurrent power for notification devices, security devices, access control equipment and auxiliary devices such as door holders. . All the NAC Power Supplies shall be synchronized. The power supply shall support up to 24 amp hour batteries.
 - 1. Power supply shall be minimum of 10 amps and UL 864 Listed.
 - 2. Four independent 3amp NAC circuits. Each being configurable as auxiliary power.
 - 3. All circuits shall be synchronized.
 - 4. Shall be EDWARDS, model BPS10A.

2.6 INTELLIGENT ANALOG SYSTEM SMOKE DETECTORS

- A. General Requirements for Intelligent Analog Detectors
 - 1. Integral Microprocessor: All decision are made at the detector determining if the device is in the alarm or trouble condition.
 - 2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, last maintenance date, number of alarms and troubles, time of last alarm1 and analog signal patterns for each sensing element just before last alarm.
 - 3. Electronic Addressing: Permanently stores programmable system address. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable.
 - 4. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location and the device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.

5. Sensitivity Range: Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. It shall be possible to program control panel activity to each level.
 6. Pre-Alarm: Detector stores 20 pre-alarm sensitivity values to alert local personnel prior to the sensor reaching a full evacuation sensitivity. Sensitivity values can be set in 5% increments.
 7. Environmental Compensation: The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal when the detector reaches 75% (Dirty) to 99% (More Dirty) compensation has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
 8. Twin Status LEDs: Flashing Green LED shows normal; flashing RED shows alarm state; steady RED and steady GREEN show alarm state in stand-alone mode, visible from any direction.
 9. UL Sensitivity Testing: The detector shall utilize a supervised microprocessor that is capable of monitoring the sensitivity of the detector. If the detector sensitivity shifts outside of the UL limits, a trouble signal is sent to the panel.
 10. Device Replacement: The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.
- A. Intelligent 3D Multi-sensor Detector (Photo/Thermal and Time)
1. Provide intelligent analog addressable 3D multi-sensor smoke detector is an intelligent device that contains a photoelectric smoke sensor and a fixed-temperature heat sensor.
 2. The heat sensing element shall be separate means of detection and annunciation from the smoke chamber. The 135F fixed-temperature heat sensor shall be UL 521 listed.
 3. The detector shall have a field replaceable smoke chamber.
 4. Provide EDWARDS, model SIGA2-PHS.
- B. Intelligent Photoelectric Detector
1. Provide intelligent analog addressable photoelectric smoke detectors at the locations shown on the drawings.
 2. The detector shall have a field replaceable smoke chamber.
 3. Provide EDWARDS, model SIGA-PD.
- C. Intelligent Carbon Monoxide Detector
1. Provide Intelligent CO Sensor is an intelligent device that uses a CO sensor to detect carbon monoxide from any source of combustion and analyzes the sensor data to determine when to initiate a life safety CO alarm. Carbon monoxide electrolytic sensing module shall provide toxic gas sensing to UL2034 and UL2075 standards.
 2. The detector signals to the control panel when the CO sensor reaches its end of life. The CO element shall be field replaceable.
 3. The CO Detector shall activate upon the following conditions:
 - a. 70 PPM for 60 – 240 minutes
 - b. 150 PPM 10- 50 minutes
 - c. 400 PPM 4 – 15 minutes
 4. The CO activation shall be programmable type as follows: Alarm, Supervisory Latching, Supervisory Non-Latching, Monitor Latching, or Monitor Non-Latching.

- D. Intelligent 135 Degree Fixed Temperature / Rate of Rise Heat Detector
1. Provide intelligent combination fixed temperature/rate-of-rise heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate-of-rise alarm point of 15°F (9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 50 feet (21.3m) centers and be suitable for wall mount applications.
 2. Provide EDWARDS, model SIGA-HRD.
- E. Intelligent Fixed Temperature Heat Detector
1. Provide intelligent fixed temperature heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The heat detector shall have a nominal alarm point rating of 135°F (57°C). The heat detector shall be rated for ceiling installation at a minimum of 50 feet (21.3m) centers and be suitable for wall mount applications.
 2. Provide EDWARDS, model SIGA-HFD.
- F. Intelligent Multi-Sensor Detectors Types
1. Multi-criteria sensor can be any combination of photoelectrical smoke sensing, heat and carbon monoxide (CO) detection. The combined photoelectric smoke detection/heat/CO module shall have separate sensors that adjust the detection profile in response to the input from the sensors.
 - a. Provide EDWARDS, model SIGA-PHCD
 2. Multi-criteria detector can be combination of photoelectrical smoke sensing and carbon monoxide (CO) detection.
 - a. Provide EDWARDS, model SIGA-PCD
 3. Multi-criteria detector can be combination of fix-temperature heat and carbon monoxide (CO) detection.
 - a. Provide EDWARDS, model SIGA-HCD
 4. All the Multi-Sensor detector shall use only one address on the SLC.
 - a. The CO activation shall be programmable type as follows: Alarm, Supervisory Latching, Supervisory Non-Latching, Monitor Latching, or Monitor Non-Latching.
- G. Detector Base Types
1. Provide standard detector mounting bases suitable for mounting on 1-gang, or 4inch octagon box and 4 inch square box. The base shall, contain no electronics and support all series detector types. Bases with electronics or dip-switches are not acceptable.
 - a. Provide EDWARDS, model SIGA-SB or SB4.
- H. Intelligent Duct Smoke Detector - Photoelectric
1. Provide intelligent photoelectric duct smoke detector at the locations shown on the drawings.
 - a. One form C auxiliary alarm relay rated at 2amps @ 30Vdc.
 - b. The operating range shall be 100ft/min to 4,000ft/min air velocity and temperature range of -20 to 158F.
 - c. Sample tube can be installed with or without the cover place and be rotated in 45- degree increments to ensure proper alignment with duct airflow.
 - d. Local magnet-activated test switch.
 - e. Provide EDWARDS, model SIGA-SD

2. Provide remote test station with Alarm LED and Key Switch.
 - a. Provide EDWARDS, model SD-TRK.
3. Relay Fan Shutdown: Rated to interrupt fan motor control circuit. Furnish and install separate device for each motor start. Connect to motor start as required for fan shutdown during alarm condition.
 - a. Provide EDWARDS, model SIGA-CR.

2.7 INTELLIGENT MODULES

- A. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller.
 1. Integral Microprocessor: All decisions are made at the module determining if the device is alarm or trouble condition.
 2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, number of alarms and troubles, time of last alarm.
 3. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location. The device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
 4. Twin Status LEDs: The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status.
 5. Input and output circuit wiring shall be supervised for open and ground faults.
 6. Two styles of modules shall be available, those designed for gang box mounting, and where multiple modules are required in a single location, plug in modules shall be provided with a Universal Input/Output motherboard.
- B. Intelligent Input Module. The Input Module shall provide one or two supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 1/2" (64mm) deep 1-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:
 1. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
 2. Normally-Open Alarm Delayed Latching (Waterflow Switches)
 3. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
 4. Normally-Open Active Latching (Supervisory, Tamper Switches)
 5. Provide EDWARDS model SIGA-CT1 or CT2 or SIGA-MCT2
- C. Intelligent Relay Module. Provide addressable control relay circuit modules shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The module shall be suitable for mounting on North American 2 1/2" (64mm) deep 1-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 1-gang covers.
 1. Provide EDWARDS, model SIGA-CR or SIGA-MCR

- D. Intelligent High Current Relay Module. Provide addressable control relay circuit modules shall provide two (2) form C dry relay contacts rated at 24Vdc @ 7 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The module shall be suitable for mounting on North American deep 4-inch square.
 - 1. Provide EDWARDS, model SIGA-CRH

- E. NAC Control Module: Provide intelligent NAC control module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. The gang box - mounted version shall be suitable for mounting in North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The plug-In version shall plug into a universal multi-module motherboard. The NAC control module shall support the following operations:
 - 1. 24volt NAC circuit
 - 2. Audio notification circuit 25v or 70v
 - 3. Telephone Power Selector with Ring Tone (Firefighter's Telephone)
 - 4. Visual Synchronized Output to Genesis appliances or to NAC Power Supply.
 - 5. Provide EDWARDS, model SIGA-CC1 or -CC1S or SIGA-MCC1 or MCC1S.

- F. Sounder Base Tone Control Module: Provide intelligent temporal pattern generator is an addressable device that generates sound patterns for fire (Temporal 3) or carbon monoxide (Temporal 4) to sounder bases. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. NAC control module shall support the following operations:
 - 1. 24volt NAC circuit
 - 2. Synchronized audible tone to all sounder bases and building audibles.
 - 3. Alarm signal continues until the system resets or is manually silenced from the control panel.
 - 4. Visual Synchronized Output to Genesis appliances or to NAC Power Supply.
 - 5. Provide EDWARDS, model SIGA-TCDR

2.8 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 - 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. The manual pull station will have an intelligent module integral of the unit.
 - 3. Station Reset: key operated switch shall match the control panel key.
 - 4. Manual pull stations that initiated an alarm condition by opening the unit are not acceptable.
 - 5. Provide EDWARDS, model SIGA-278.

2.9 NOTIFICATION APPLIANCES

- A. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions.

- B. All appliances shall be wall mounted red body and marking of FIRE and shall be UL 1971 & UL 464 listed Fire Protective Service.
- C. Notification Appliances – Visual
 - 1. Provide clear lens strobes that provide a smooth light distribution pattern field selectable candela 15 cd, 30 cd, 75 cd, and 110 cd flash output rating, UL1971 listed with in-out screw terminals shall be provided for wiring. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting. Provide synchronization to within 10 milliseconds for an indefinite period without the use of separately installed remote synch modules. The strobes shall mount to one-gang electrical box.
 - 2. High candela clear lens strobes that provide field selectable candela 95cd, 115cd, 150cd and 177cd flash output rating, UL1971 listed with in-out screw terminals shall be provided for wiring.
 - 3. Provide EDWARDS, model Genesis Series devices.
- D. Horns
 - 1. Provide low profile wall mounted horns at the locations show on the drawings.
 - 2. Low profile horns shall mount in North American 1-gang box, and protrude less than 1” from the finished wall. The work FIRE shall be prominently displayed on the housing.
 - 3. The horns shall provide an audible output of 85 dBA at 10 ft. when measured in reverberations room per UL-464, and have a selectable steady or synchronized temporal (3-3-3) output pattern.
 - 4. Horn power, horn silencing and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.
 - 5. The horns shall be Edwards Genesis G1 Series.
- E. Horns – Weatherproof
 - 1. Provide low profile weatherproof horns at the location s shown on the drawings.
 - 2. The weatherproof horns shall mount in North American 4” square 1 ½” deep electrical box for indoor applications and a factory supplied back box for weatherproof applications.
 - 3. The horns shall be suitable for wall or ceiling mount and operate in temperatures from -40 to 151 degrees F. The word FIRE shall be prominently displayed on the housing.
 - 4. The horns shall provide a user configurable high/low audible output of 89.7/85.4 dBA at 10 ft. for steady output and an 84.2/81.7 4 dBA at 10 ft. for temporal output when measured in reverberations room per UL-464.
 - 5. Horn and strobe power, horn silencing and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.
 - 6. The weatherproof horns shall be Edwards Genesis WG4 Series.

2.10 GUARDS FOR PHYSICAL PROTECTION

- A. Provide welded mesh of size and shape for the manual pull stations, smoke detectors, notification appliances in all gym areas.

2.11 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 120-V ac, 24-V ac or dc.
4. Provide EDWARDS, model 1500 series or DH Series.

2.12 INSPECTION BAR CODES

- A. Inspection bar codes shall be installed on all initiating devices, annunciators, control panels and power supplies.
- B. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of serial numbers. Serial number shall be printed below the bar code for identification purposes.
- C. Inspection bar codes shall be limited in size to no more than 2" (5cm) in width, and 3/8" (2 cm), in height and shall include a Mylar[®] or other protective coating to protect the bar code from fading due to sunlight or exposure.
- D. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12" from the device during inspection.

2.13 WIRE AND CABLE

- A. Signaling Line Circuits – Network Data: Twisted pair, not less than No. 18 AWG or as recommended by the manufacturer.
- B. Signaling Line Circuits – Intelligent Loop: Non-Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer.
 1. Circuit Integrity Cable: Provide as required to meet NFPA or Local Code requirements.
 2. CI Cable shall meet article 760, power limited fire alarm service.
- C. Notification Appliance Circuits
 1. Audio: Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer.
 2. Visual. Non-Twisted pair, not less than No. 12 AWG or as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 and NEC Article 760 for installation of fire-alarm equipment.
- B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
- C. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
 1. Connect new equipment to existing control panel in existing part of the building.

2. Connect new equipment to existing monitoring equipment at the supervising station.
 3. Expand, modify, and supplement existing equipment as necessary to extend existing functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- D. Smoke- or Heat-Detector Spacing:
1. Comply with NFPA72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 2. Comply with NFPA72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
 3. Smooth ceiling spacing shall not exceed 30 feet.
 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
 5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
- E. Duct Smoke Detectors: Comply with NFPA72 and NFPA90A. Install sampling tubes so they extend the full width of duct.
- F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.
- H. Notification Appliance Devices: Install between 80 and 96 inches on the wall.
- I. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.
- J. Annunciator: Install with top of panel not more than 56 inches above the finished floor.

3.2 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 8 Section "Door Hardware." Connect hardware and devices to fire-alarm system.
1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
1. Smoke dampers in air ducts of designated air-conditioning duct systems.
 2. Alarm-initiating connection to activate emergency lighting control.
 3. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.

4. Supervisory connections at valve supervisory switches.
5. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
6. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
7. Supervisory connections at fire-pump engine control panel.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 00 "Electrical Identification."
- B. Install framed instructions in a location visible from fire-alarm control unit.
- C. All initiating devices shall have bar code label installed visibly on the device. This bar code shall be used for digital inspection of the fire alarm system using Building Reports.Com.

3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by Architect, Engineer and authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72; retain the "Initial/Reacceptance" column and list only the installed components.
 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
 - F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
 - G. Prepare test and inspection reports.
 - H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
 - I. Annual Test and Inspection: During the warranty period, each year test fire-alarm system complying with visual and testing inspection requirements in NFPA72. Use forms developed for initial tests and inspections.
 - J. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Owner. Unless, the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicated a devices trouble. A copy of UL letter is to be provided as proof of system operation

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

3.7 WIRING

- A. Power Requirements:
 - 1 The Fire Alarm Control Panel (FACP) and/or Notification Appliance Circuit (NAC) panels shall be connected to a separate 20 ampere, 120 volt dedicated branch circuit labeled as FIRE ALARM.
 - 2 The Control Panel Cabinet shall be grounded securely using a copper grounding conductor.
 - 3 Conduit shall enter into the Fire Alarm Control panel backbox only at those areas of the back box which have factory conduit knockouts.
 - 4 All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; an audible and visual trouble signal will be activated until system and its associated field wiring are restored to normal condition.
- B. Cables must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
- C. SLC loops shall be loaded to no more than 75% of their capacity.

- D. Install wiring in accordance with Section 26 05 00 and shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer. See Article
- E. Provide all fire alarm system wiring drops to devices within raceways and junction boxes. Where existing conditions prohibit fishing existing walls, so as to avoid excessive cutting and restoration metallic wiremold finished to match existing wall surface shall be permitted where allowed by OWNER/ENGINEER, routing subject to OWNER/ENGINEER approval.
- F. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- G. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage. Ref: NFPA 72, 1999 2-3.6.1.3.
- H. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas if approved by Owner/Engineer before installation. All system junction boxes shall be as manufactured by system supplier or painted red and stenciled with fire alarm system designation.
- I. All conductor identification shall be labeled in accordance with Section 26 05 00 at all accessible locations including at control panel, junction boxes and at devices for future tracing and maintenance.
- J. Coordinate connections with supplier of central station network system. SLC loop shall be 2 #16 shielded FPLR or FPLP cable as required.
- K. Signal circuit wiring shall be 2 conductor #14 or 2 conductor #12 FPLR or FPLP cable as required. 2#14 or 2#12 THHN is acceptable if signal circuits are enclosed in listed raceway. Synchronization modules shall be utilized to provide audio and visual synchronization over 2 conductors. Consult loading chart for proper wire gauge and wire length to insure against excessive DC voltage drop. A minimum of 20.5V DC must be available at the last signal of a NAC under full alarm condition.
- L. Provide 2 #14 from control panel or door holder power supply to door holders.

3.8 FREE AIR WIRING

- A. All wiring shall be run "free-air", in conduit or in surface raceway. "Free-air" wiring is allowed where it can be completely concealed. If wiring cannot be concealed, it shall be installed in wiremold in finished areas and in conduit in unfinished areas.
- B. Where installed "free-air", comply with the following:
 1. Cable shall run at right angles and be kept clear of other trades work.
 2. Cables shall be supported according to code utilizing bridle rings anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).
 3. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 12-inches, another support shall be used.
 4. Cable shall never be laid directly on the ceiling grid.
 5. Cables shall not be attached to or supported by, existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.
 6. A coil of 2 feet in each cable shall be placed in the ceiling at each "free-air" wired fire alarm device. These "service loops" shall be secured at the last cable support before the cable reaches the device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

7. Devices wired with conduit shall be provided with an 8-inch wire tail at each device box and 36-inch wire tails at the FACP and FAAP.
 8. To reduce or eliminate EMI, the following minimum separation distances from $\leq 480V$ Power lines shall be adhered to:
 - a. Twelve (12) inches from power lines of $< 5\text{-kVa}$.
 - b. Eighteen (18) inches from high voltage lighting (including fluorescent).
 - c. Thirty-nine (39) inches from power lines of 5-kVa or greater.
 - d. Thirty-nine (39) inches from transformers and motors.
 9. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips shall be used to spread the strain over a longer length of cable.
 10. Manufacturers minimum bend radius specifications shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
 11. All vertical cable extensions to fire alarm devices located below the finished ceiling shall be in conduit.
- C. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.
- D. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to insure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away" or other approved method.

3.9 DEPARTMENT OF SAFETY AND PROFESSIONAL SERVICES SUBMITTAL

- A. This Contractor is responsible for making required submittals.
- B. Pay fees for reviewing submittal.
- C. Make submittal after engineering review has been obtained for shop drawings.
- D. Incorporate any REVIEW comments into shop drawings and as-builts.
- E. This Contractor is responsible to pay all local fire department fees.

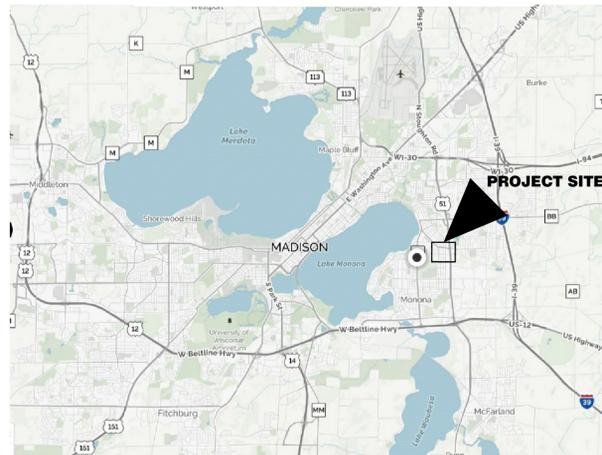
END OF SECTION 28 31 00

DANE COUNTY LIBRARY SERVICE RENOVATION

1880 SOUTH STOUGHTON ROAD

TOWN OF BLOOMING GROVE

MADISON, WISCONSIN



MADISON, WISCONSIN



PROJECT LOCATION

ABBREVIATIONS

ADA	AMERICANS WITH DISABILITIES ACT
A.F.F.	ABOVE FINISHED FLOOR
AL	ALUMINUM
AP	ACCESS PANEL
CG	CORNER GUARD
CJ	CONTROL JOINT
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
CPT	CARPET
CT	CERAMIC TILE
CUH	CABINET UNIT HEATER
EJ	EXPANSION JOINT
EWC	ELECTRIC WATER COOLER
FD	FLOOR DRAIN
FO	FOUNDATION DRAIN SYSTEM FLUSHOUT
FRT	FIRE TREATED
FX-#	FIRE EXTINGUISHER AND TYPE
GWB	GYPSUM WALL BOARD
HM	HOLLOW METAL
MB	MARKER BOARD
TB	TACK BOARD
BB	BULLETIN BOARD
M.O.	MASONRY OPENING
N.I.C.	NOT IN CONTRACT
O.F.C.I.	OWNER FURNISHED CONTRACTOR INSTALLED
O.F.O.I.	OWNER FURNISHED OWNER INSTALLED
OPP	OPPOSITE
P.LAM.	PLASTIC LAMINATE
REV	REVERSE
R.O.	ROUGH OPENING
S.S.	STAINLESS STEEL
TZO	TERRAZZO
U.N.O.	UNLESS NOTED OTHERWISE
VCT	VINYL COMPOSITION TILE
WD	WOOD
WP	WATER PROOFING
WPT	WORK POINT

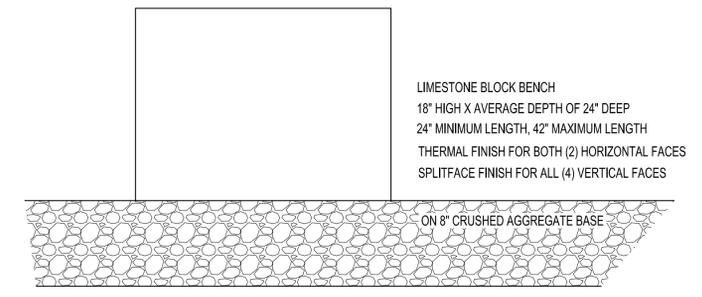
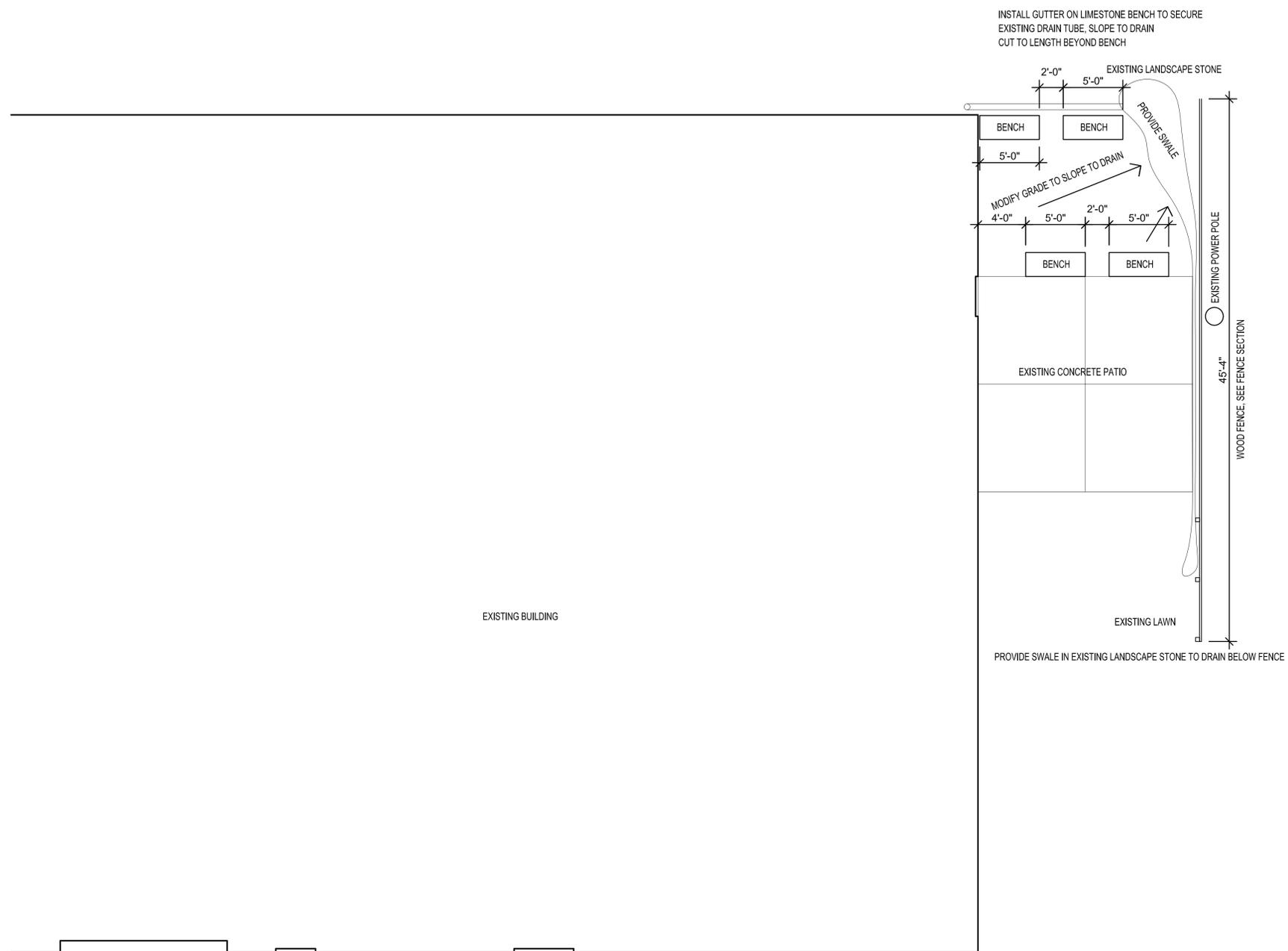
MAJOR USE & OCCUPANCY CLASSIFICATION: B
CONSTRUCTION CLASSIFICATION: IIIIB
GROSS FLOOR AREA OF RENOVATION: 3,350 SF
SPRINKLERED
MAXIMUM EXIT ACCESS TRAVEL DISTANCE: 250'

INDEX OF DRAWINGS

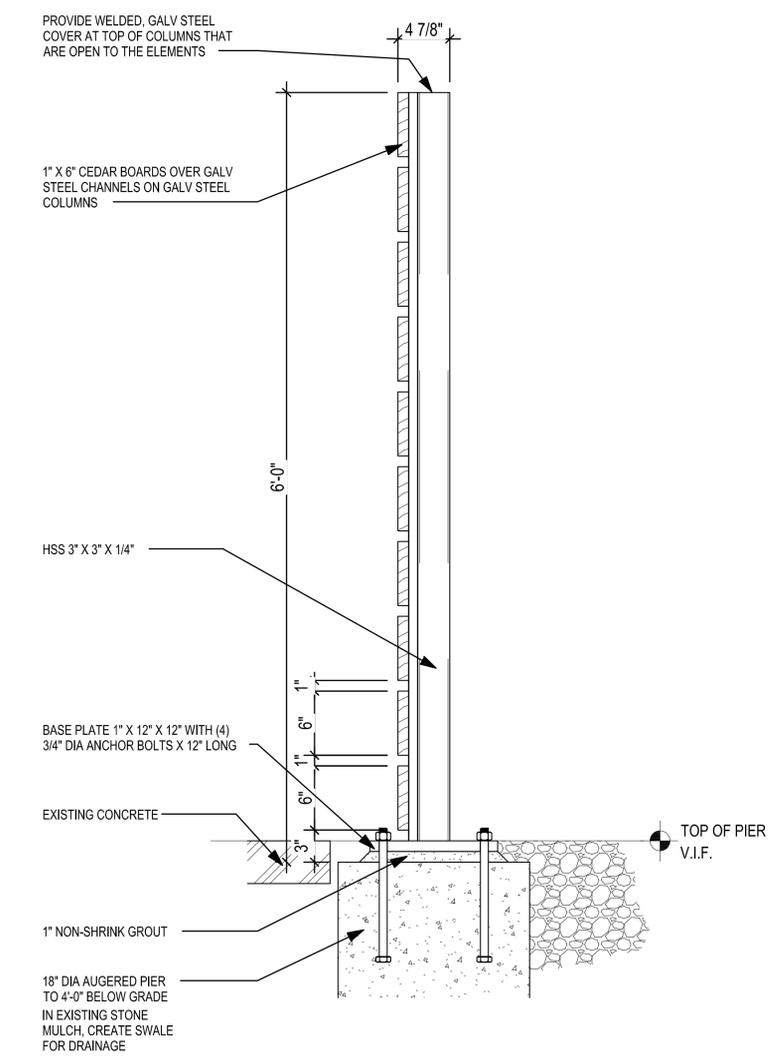
GENERAL	
G100	COVER SHEET, INDEX OF DRAWINGS AND SYMBOLS & ABBREVIATIONS
GENL	
C200	SITE PLAN AND DETAILS
DEMOLITION	
D200	FIRST FLOOR DEMOLITION PLAN
ARCHITECTURAL	
A200	FIRST FLOOR PLAN AND EXTERIOR IMPROVEMENTS
A300	REFLECTED CEILING PLAN
A700	INTERIOR ELEVATIONS, PARTITION TYPES, DETAILS AND DOOR SCHEDULE
A900	FINISH PLAN AND ILLUSTRATIVE FURNITURE PLAN
PLUMBING	
PD101	FIRST FLOOR PLUMBING DEMOLITION PLAN
P100	FIRST FLOOR PLUMBING PLAN
FIRE PROTECTION	
FP100	FIRST FLOOR FIRE PROTECTION PLAN
HVAC	
M100	HVAC PLAN - DEMOLITION
M101	HVAC NEW WORK PLAN
M102	MECHANICAL ROOM PLAN, HVAC SCHEDULES AND DETAILS
ELECTRICAL	
E000	SYMBOLS, ABBREVIATIONS AND SHEET INDEX
E100	LIGHTING PLAN
E200	POWER AND SYSTEMS PLAN
E300	ROOF PLAN
E400	ELECTRICAL RISER
E500	ELECTRICAL SCHEDULES
E600	ELECTRICAL DETAILS

ARCHITECTURAL SYMBOLS AND LEGEND

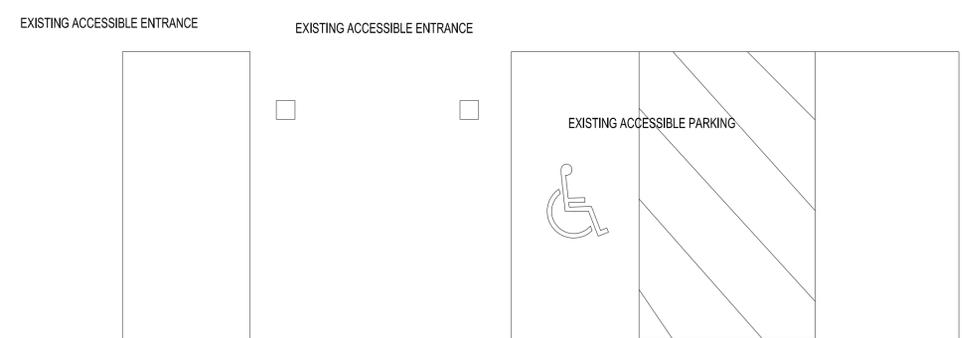
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	SHEET REFERENCE
	DETAIL NUMBER
	WALL SECTION REFERENCE
	SHEET REFERENCE
	DETAIL NUMBER
	WALL SECTION REFERENCE
	ELEVATION REFERENCE
	PARTITION TYPE REF. SEE SHEET A700
	NEW WALLS
	WINDOW TYPES SEE A700
	1 HOUR FIRE RATED WALL
	2 HOUR FIRE RATED WALL
	DOOR SWING w/NUMBER. SEE A700
	EXISTING DOOR SWING w/NUMBER. SEE A700
	REVISIONS
	RECESSED FIRE EXTINGUISHER
	SURFACE MOUNT FIRE EXTINGUISHER
	SPOT ELEVATION (FEET-INCHES)
	SPOT ELEVATION (FEET.DECIMAL)
	ROOM NAME & NUMBER SEE FINISH PLAN SHEET A900



3 LIMESTONE BENCH SECTION
1/12"=1'-0"



2 FENCE SECTION
1/12"=1'-0"



1 SITE PLAN
3/16"=1'-0"

NORTH

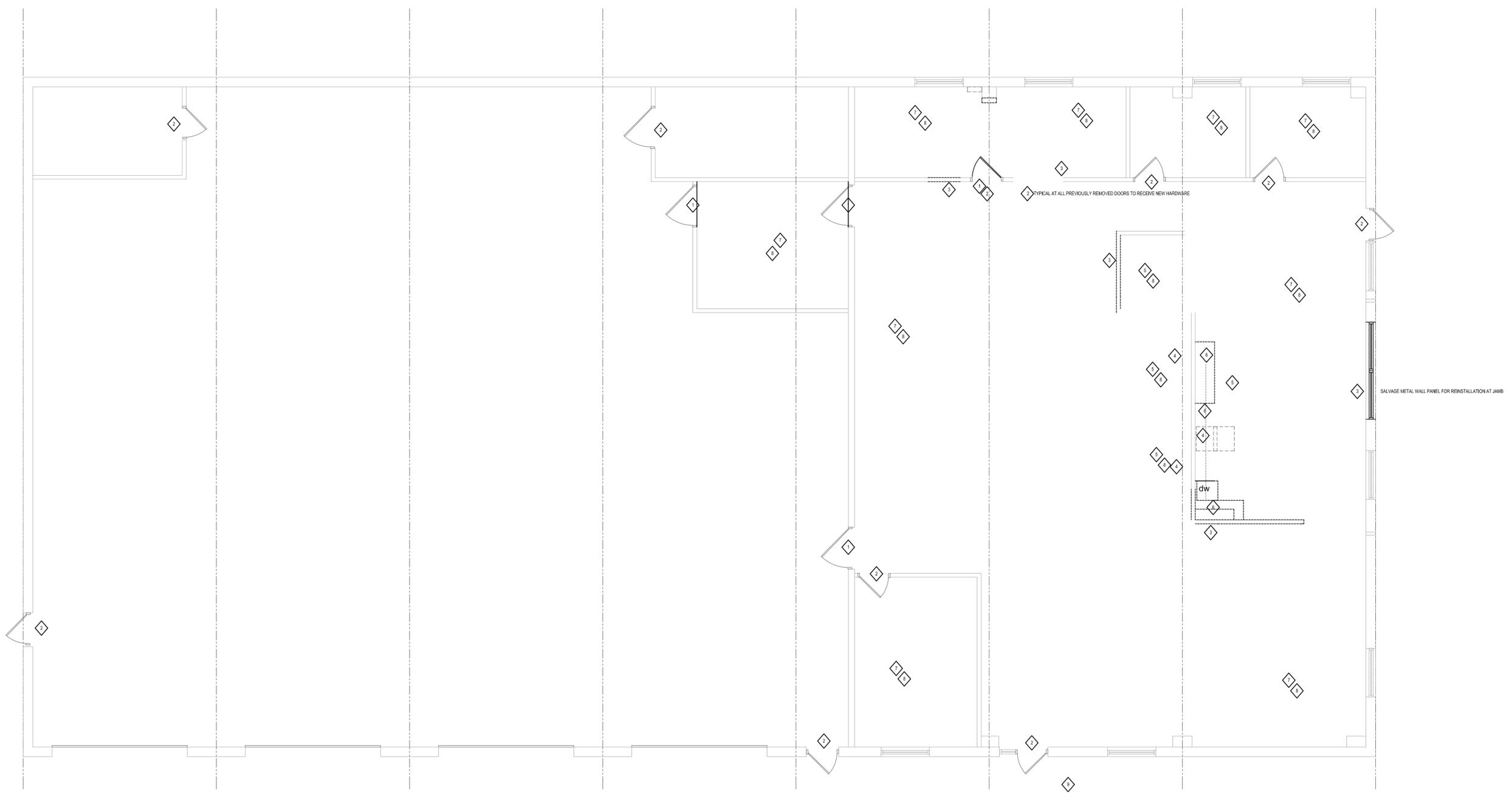
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PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

DRAWING
FIRST FLOOR DEMOLITION
PLAN

DATE
04.04.17

D200



DEMOLITION NOTES	
1	CARPET WILL BE REMOVED BY OWNER PRIOR TO NOTICE TO PROCEED.
2	DEMO PORTIONS OF WALLS FOR INSTALLATION OF MEP WITHIN EXISTING WALLS. SEE MEP. PATCH TO MATCH.
3	DEMO DOOR AND HM FRAME. SALVAGE DOOR FOR REUSE WHERE SCHEDULED.
4	DEMO HARDWARE AND MODIFY DOOR/FRAME FOR INSTALLATION OF HARDWARE
5	DEMO PORTION OF EXISTING WALL.
6	REMOVE ACCESSORIES AND FINISHES FOR INSTALLATION OF FINISHES/ACCESSORIES.
7	DEMO RESILIENT FLOOR FOR INSTALLATION OF FINISHES..
8	DEMO PLAM COUNTERTOP. REMOVE CASEWORK FOR REINSTALLATION. SEE 2A700.
9	DEMO ALL RUBBER BASE THROUGHOUT.
10	DEMO ACT CEILING GRID PERIMETER TRIM AT ALL WALLS WITH MODIFIED CEILING HEIGHT. DEMO ALL ACT CEILING GRID OR V.I.F. FOR MODIFICATION TO RECEIVE SCHEDULED FIXTURES AND DIFFUSERS.
11	REMOVE BUILDING IDENTIFICATION SIGNAGE. MAINTAIN WEATHER TIGHT EXTERIOR.

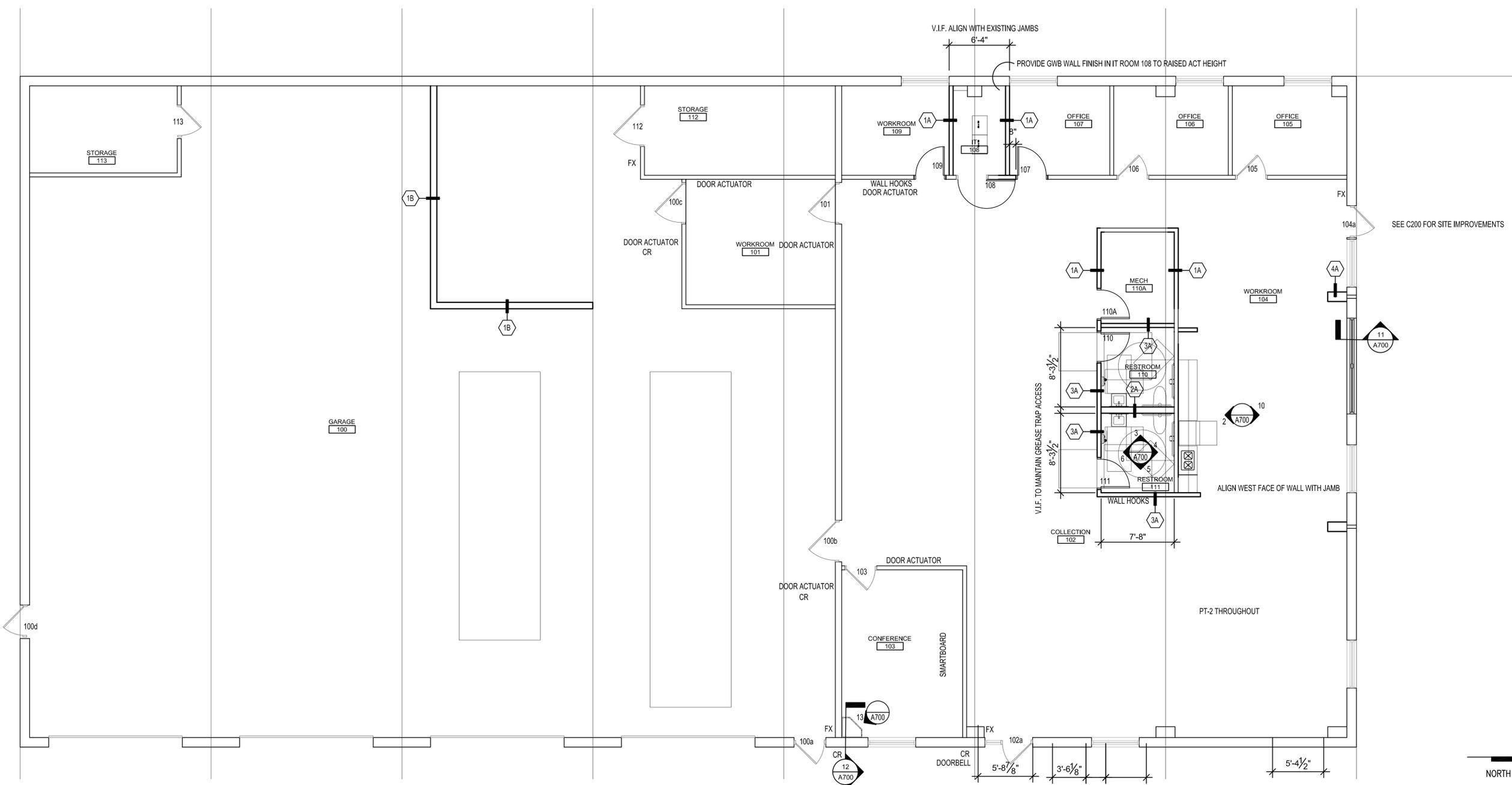
NORTH

1 FIRST FLOOR DEMOLITION PLAN
3/16"=1'-0"

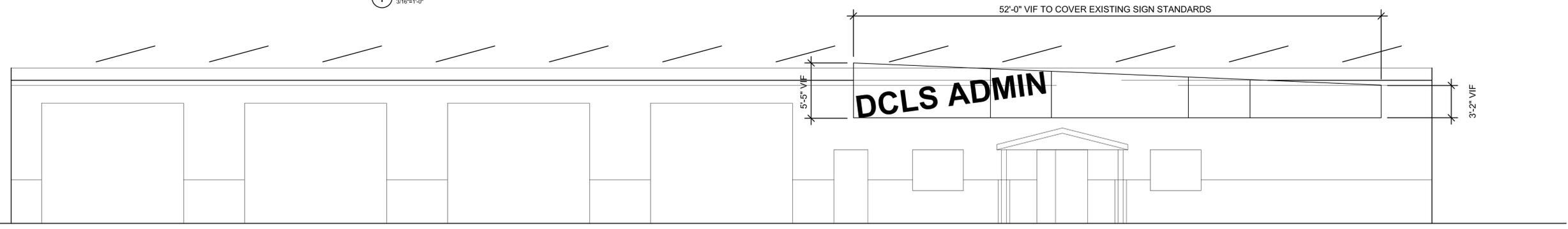
Architecture
Planning

DorschnerAssociates, Inc.
849 E. Washington Ave., Ste 112
Madison, Wisconsin 53703

ISSUED



1 FIRST FLOOR PLAN
3/16"=1'-0"



2 EAST EXTERIOR ELEVATION
3/16"=1'-0"

PV PANELS GENERAL ORIENTATION, VERIFY SLOPE WITH ELECTRICAL

PAINTED TEXT ON VERTICAL METAL PANEL-1 CORRUGATED PERFORATED ON LIGHT GAUGE STUDS
COORDINATE WITH EXISTING STANDARDS AND ATTACH FORWARD OF GUTTER. ADJUST ELECTRICAL DEVICES.

PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

DRAWING
FIRST FLOOR PLAN AND
EXTERIOR IMPROVEMENTS

DATE
04.04.17

A200

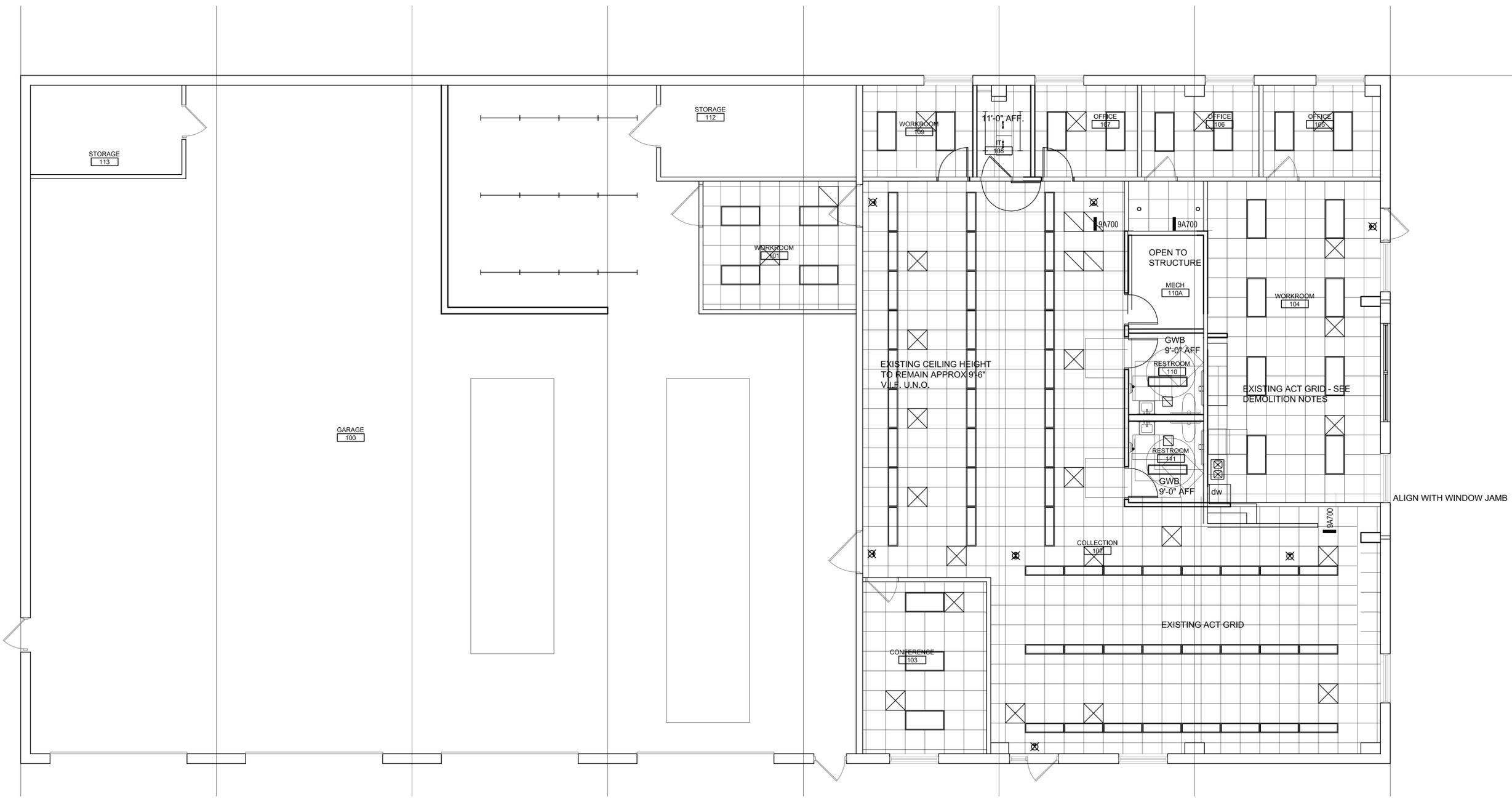
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PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

DRAWING
REFLECTED CEILING PLAN

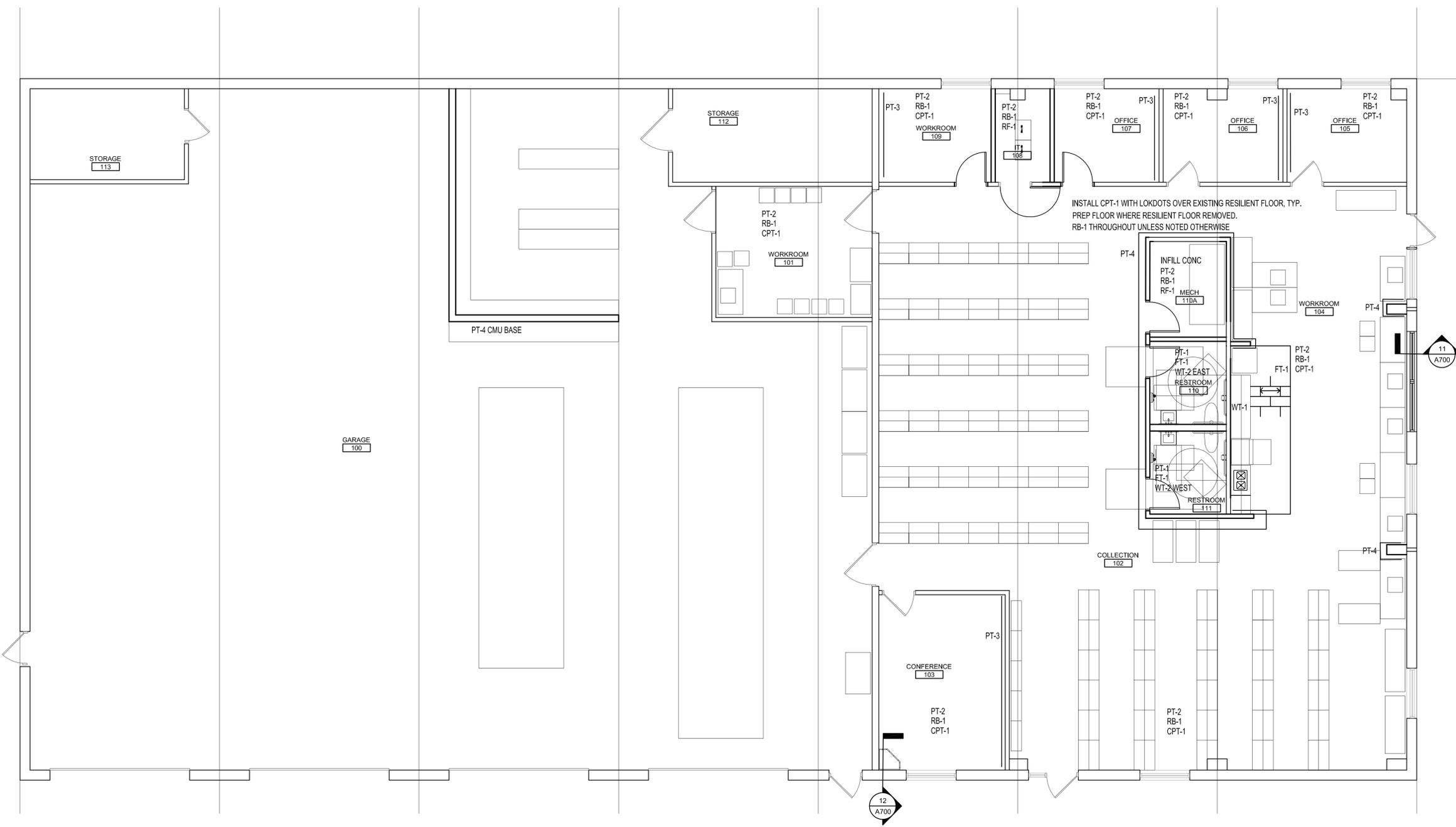
DATE
04.04.17

A300



1 FIRST FLOOR REFLECTED CEILING PLAN
3/16"=1'-0"





ISSUED

PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

DRAWING
FINISH PLAN AND
ILLUSTRATIVE FURNITURE
PLAN
DATE
04.04.17



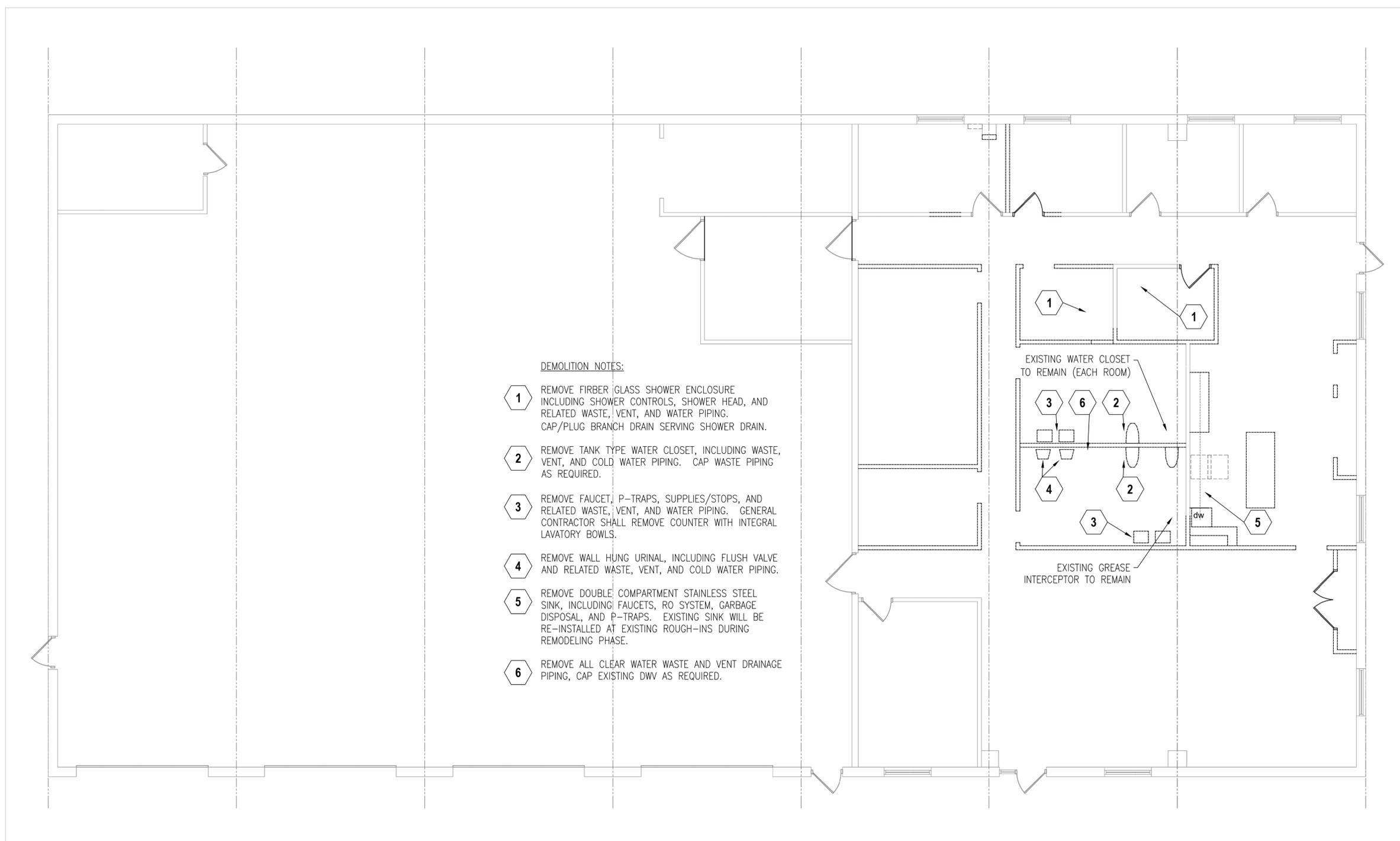
Architecture
Planning

DorschnerAssociates, Inc.
849 E. Washington Ave., Ste 112
Madison, Wisconsin 53703

SPD
SELECT PLUMBING DESIGN, LLC

4564 EVERGREEN RD (608) 836-9674
MIDDLETON, WI 53562

ISSUED



DEMOLITION NOTES:

- 1 REMOVE FIBER GLASS SHOWER ENCLOSURE INCLUDING SHOWER CONTROLS, SHOWER HEAD, AND RELATED WASTE, VENT, AND WATER PIPING. CAP/PLUG BRANCH DRAIN SERVING SHOWER DRAIN.
- 2 REMOVE TANK TYPE WATER CLOSET, INCLUDING WASTE, VENT, AND COLD WATER PIPING. CAP WASTE PIPING AS REQUIRED.
- 3 REMOVE FAUCET, P-TRAPS, SUPPLIES/STOPS, AND RELATED WASTE, VENT, AND WATER PIPING. GENERAL CONTRACTOR SHALL REMOVE COUNTER WITH INTEGRAL LAVATORY BOWLS.
- 4 REMOVE WALL HUNG URINAL, INCLUDING FLUSH VALVE AND RELATED WASTE, VENT, AND COLD WATER PIPING.
- 5 REMOVE DOUBLE COMPARTMENT STAINLESS STEEL SINK, INCLUDING FAUCETS, RO SYSTEM, GARBAGE DISPOSAL, AND P-TRAPS. EXISTING SINK WILL BE RE-INSTALLED AT EXISTING ROUGH-INS DURING REMODELING PHASE.
- 6 REMOVE ALL CLEAR WATER WASTE AND VENT DRAINAGE PIPING, CAP EXISTING DW AS REQUIRED.

EXISTING WATER CLOSET TO REMAIN (EACH ROOM)

EXISTING GREASE INTERCEPTOR TO REMAIN

FIRST FLOOR PLUMBING DEMOLITION PLAN
SCALE 3/16" = 1'-0"

PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

DRAWING
FIRST FLOOR PLUMBING
DEMOLITION PLAN

DATE
04.03.17

Architecture
Planning

DorschnerAssociates, Inc.
849 E. Washington Ave., Ste 112
Madison, Wisconsin 53703

SPD
SELECT PLUMBING DESIGN, LLC

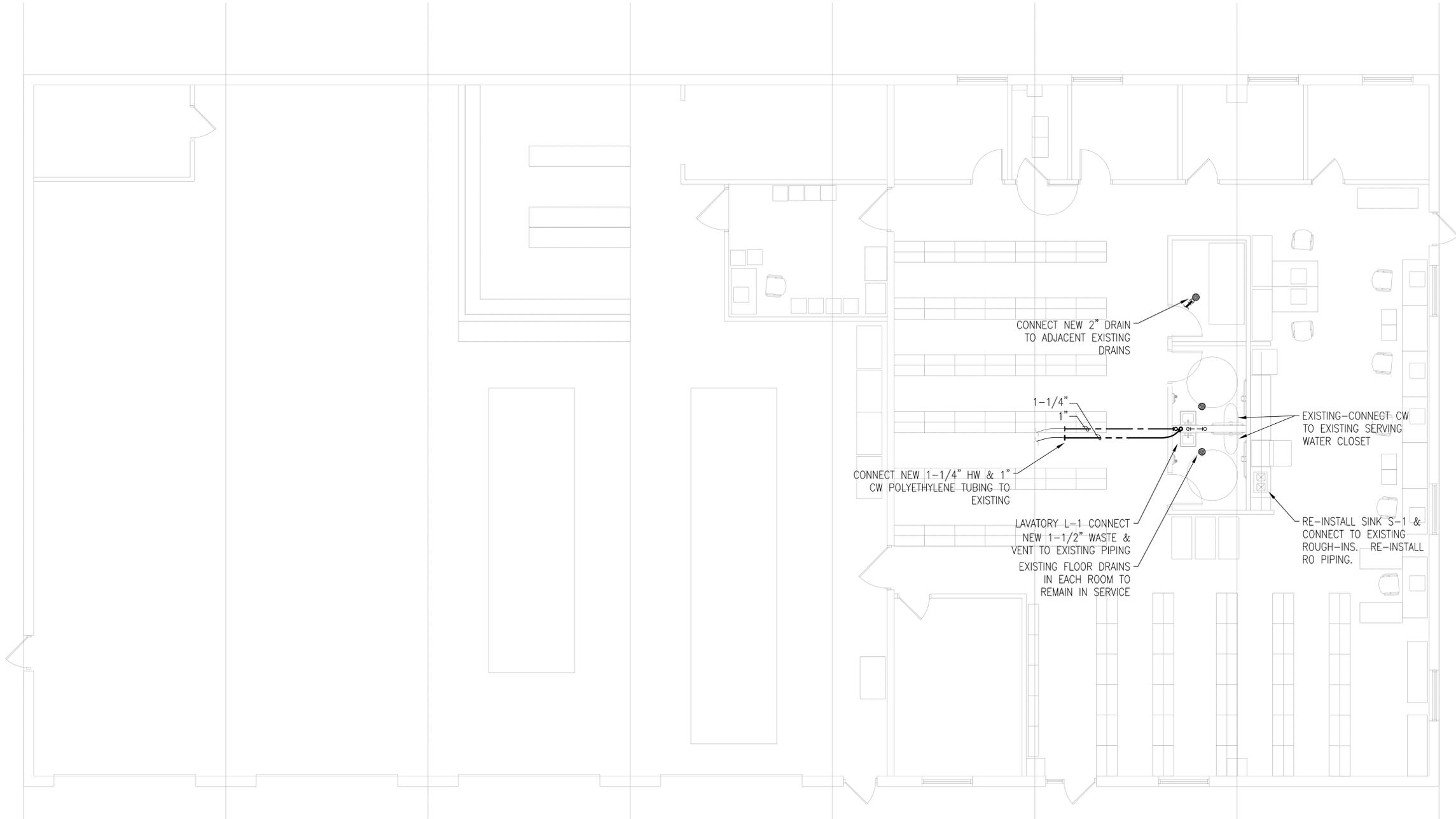
4564 EVERGREEN RD (608) 836-9674
MIDDLETON, WI. 53562

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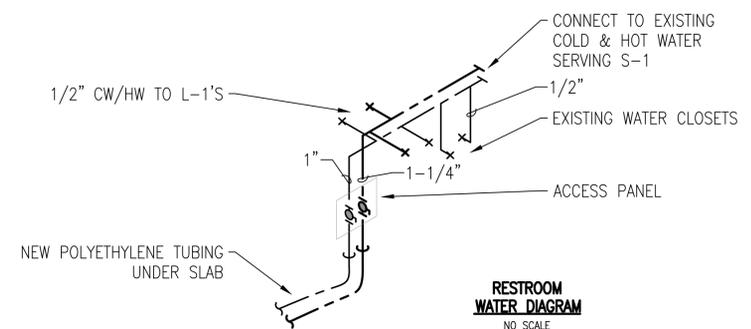
PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

DRAWING
FIRST FLOOR PLUMBING PLAN

DATE
04.03.17



FIRST FLOOR PLUMBING PLAN
SCALE 3/16" = 1'-0"



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MIDDLETON, WI 53562

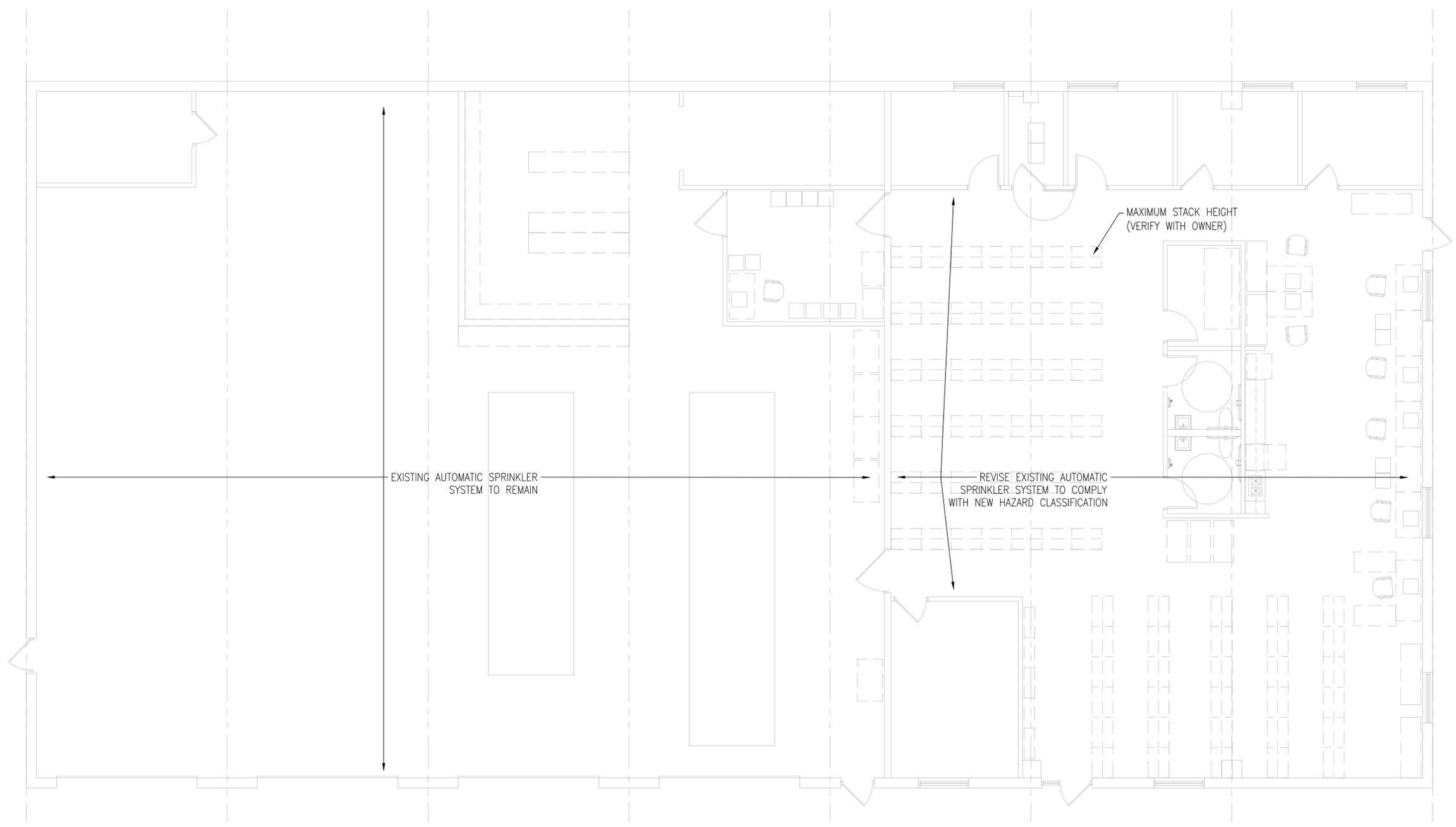
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PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

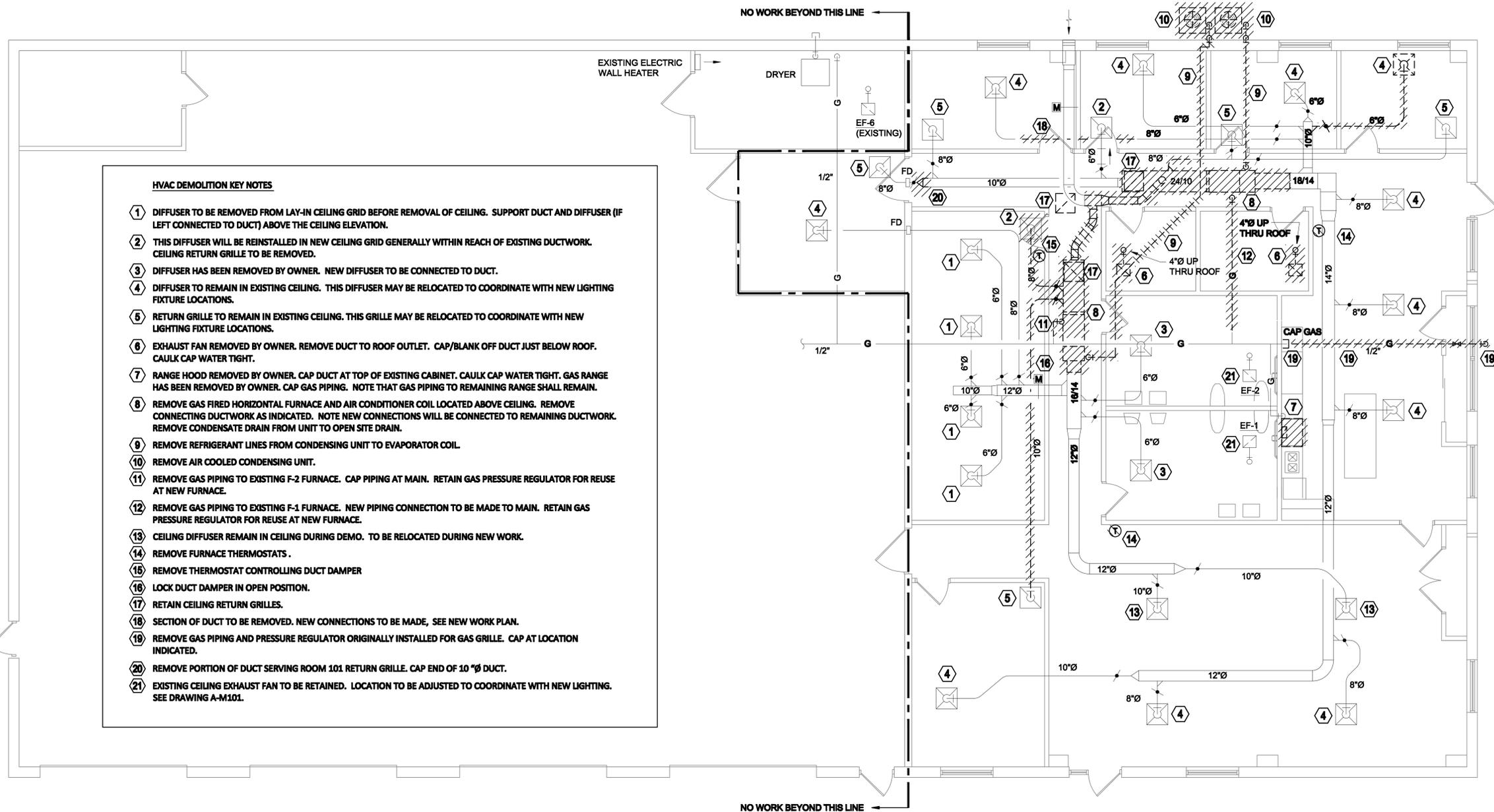
DRAWING
FIRST FLOOR FIRE
PROTECTION PLAN

DATE
04.03.17

FP100



**FIRST FLOOR FIRE
PROTECTION PLAN**
SCALE 3/16" = 1'-0"



- HVAC DEMOLITION KEY NOTES**
- ① DIFFUSER TO BE REMOVED FROM LAY-IN CEILING GRID BEFORE REMOVAL OF CEILING. SUPPORT DUCT AND DIFFUSER (IF LEFT CONNECTED TO DUCT) ABOVE THE CEILING ELEVATION.
 - ② THIS DIFFUSER WILL BE REINSTALLED IN NEW CEILING GRID GENERALLY WITHIN REACH OF EXISTING DUCTWORK. CEILING RETURN GRILLE TO BE REMOVED.
 - ③ DIFFUSER HAS BEEN REMOVED BY OWNER. NEW DIFFUSER TO BE CONNECTED TO DUCT.
 - ④ DIFFUSER TO REMAIN IN EXISTING CEILING. THIS DIFFUSER MAY BE RELOCATED TO COORDINATE WITH NEW LIGHTING FIXTURE LOCATIONS.
 - ⑤ RETURN GRILLE TO REMAIN IN EXISTING CEILING. THIS GRILLE MAY BE RELOCATED TO COORDINATE WITH NEW LIGHTING FIXTURE LOCATIONS.
 - ⑥ EXHAUST FAN REMOVED BY OWNER. REMOVE DUCT TO ROOF OUTLET. CAP/BLANK OFF DUCT JUST BELOW ROOF. CAULK CAP WATER TIGHT.
 - ⑦ RANGE HOOD REMOVED BY OWNER. CAP DUCT AT TOP OF EXISTING CABINET. CAULK CAP WATER TIGHT. GAS RANGE HAS BEEN REMOVED BY OWNER. CAP GAS PIPING. NOTE THAT GAS PIPING TO REMAINING RANGE SHALL REMAIN.
 - ⑧ REMOVE GAS FIRED HORIZONTAL FURNACE AND AIR CONDITIONER COIL LOCATED ABOVE CEILING. REMOVE CONNECTING DUCTWORK AS INDICATED. NOTE NEW CONNECTIONS WILL BE CONNECTED TO REMAINING DUCTWORK. REMOVE CONDENSATE DRAIN FROM UNIT TO OPEN SITE DRAIN.
 - ⑨ REMOVE REFRIGERANT LINES FROM CONDENSING UNIT TO EVAPORATOR COIL.
 - ⑩ REMOVE AIR COOLED CONDENSING UNIT.
 - ⑪ REMOVE GAS PIPING TO EXISTING F-2 FURNACE. CAP PIPING AT MAIN. RETAIN GAS PRESSURE REGULATOR FOR REUSE AT NEW FURNACE.
 - ⑫ REMOVE GAS PIPING TO EXISTING F-1 FURNACE. NEW PIPING CONNECTION TO BE MADE TO MAIN. RETAIN GAS PRESSURE REGULATOR FOR REUSE AT NEW FURNACE.
 - ⑬ CEILING DIFFUSER REMOVED IN CEILING DURING DEMO. TO BE RELOCATED DURING NEW WORK.
 - ⑭ REMOVE FURNACE THERMOSTATS .
 - ⑮ REMOVE THERMOSTAT CONTROLLING DUCT DAMPER
 - ⑯ LOCK DUCT DAMPER IN OPEN POSITION.
 - ⑰ RETAIN CEILING RETURN GRILLES.
 - ⑱ SECTION OF DUCT TO BE REMOVED. NEW CONNECTIONS TO BE MADE, SEE NEW WORK PLAN.
 - ⑲ REMOVE GAS PIPING AND PRESSURE REGULATOR ORIGINALLY INSTALLED FOR GAS GRILLE. CAP AT LOCATION INDICATED.
 - ⑳ REMOVE PORTION OF DUCT SERVING ROOM 101 RETURN GRILLE. CAP END OF 10" Ø DUCT.
 - ㉑ EXISTING CEILING EXHAUST FAN TO BE RETAINED. LOCATION TO BE ADJUSTED TO COORDINATE WITH NEW LIGHTING. SEE DRAWING A-M101.

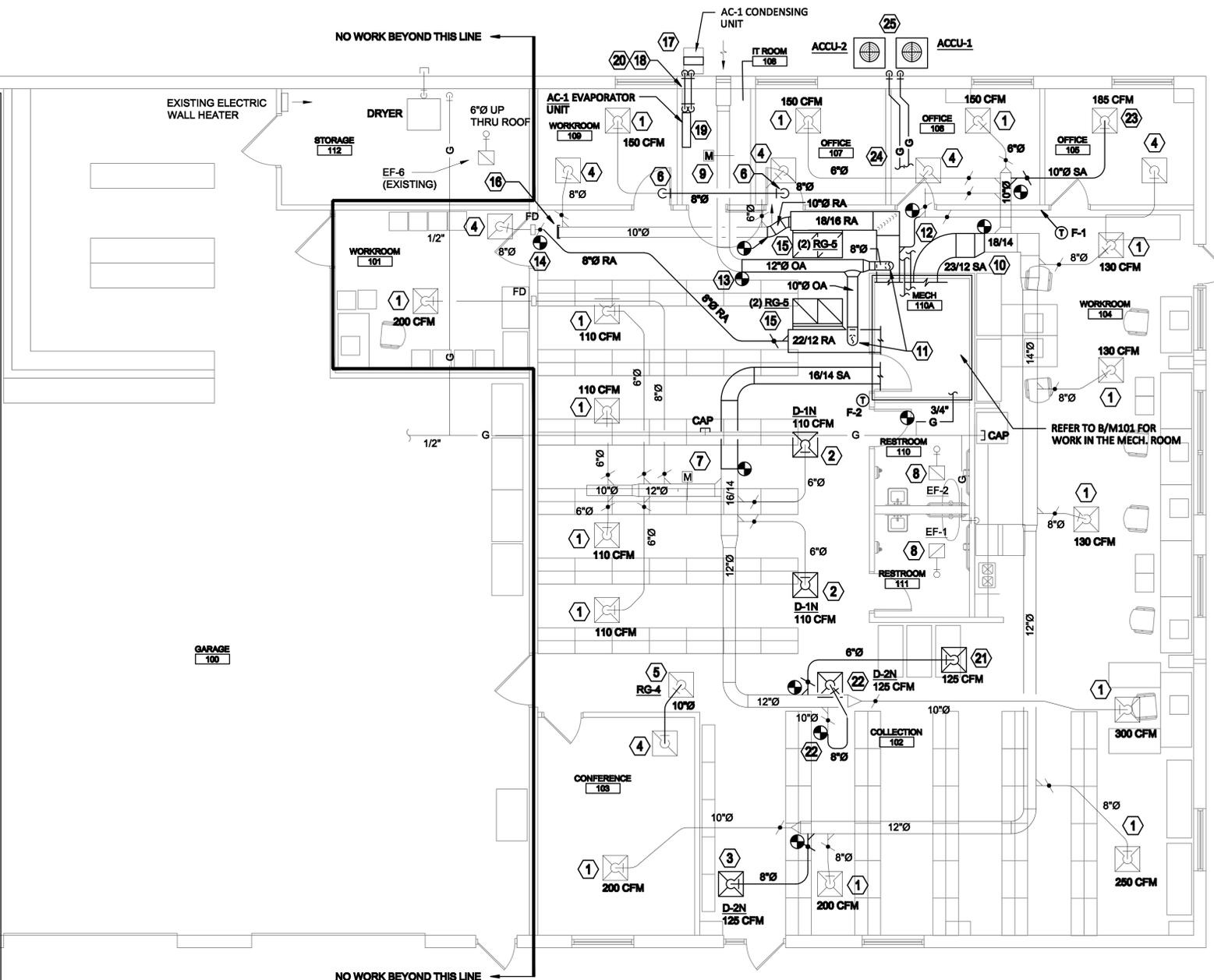
A FIRST FLOOR HVAC FLOOR PLAN - DEMOLITION
M100 SCALE: 3/16" = 1'-0"

FIRST FLOOR HVAC GENERAL NOTES

1. SUPPLY AIR IS TO BE REBALANCED TO VOLUMES INDICATED ON THE DRAWINGS.
2. IF THE EXISTING DUCT IS NOT OF SUFFICIENT LENGTH TO RELOCATE THE EXISTING SUPPLY DIFFUSER OR RETURN GRILLE TO THE INDICATED LOCATION NOTIFY THE ENGINEER AND A DECISION WILL BE MADE TO DETERMINE A POTENTIAL ALTERNATE LOCATION.
3. CONTRACTOR TO VERIFY SIZES OF EXISTING DUCTWORK WHEN REQUIRED TO MAKE NEW CONNECTIONS.

FIRST FLOOR HVAC ROOM KEY NOTES

- 1 RELOCATE EXISTING DIFFUSER TO NEW LOCATION. EXTEND DUCT AS REQUIRED. COORDINATE WITH NEW CEILING GRID AND LIGHTING. REFER TO DRAWINGS E100 AND A300.
- 2 NEW CEILING DIFFUSER D-1N, CONNECT TO EXISTING SUPPLY AIR DUCT AS INDICATED ON DRAWING.
- 3 NEW CEILING DIFFUSER D-2N, CONNECT TO EXISTING SUPPLY AIR DUCT AS INDICATED ON DRAWING.
- 4 RELOCATE EXISTING RETURN GRILLE TO NEW LOCATION. EXTEND DUCT AS REQUIRED. COORDINATE WITH NEW CEILING GRID AND LIGHTING. REFER TO DRAWINGS E100 AND A300.
- 5 INSTALL SALVAGED 10 INCH RETURN GRILLE TO THIS LOCATION. CONNECT 10 INCH ROUND DUCT NOW RETURNING AIR FROM ROOM 103.
- 6 CONNECT TO EXISTING WHERE A SECTION WAS REMOVED RISE UP AND RUN NEW HORIZONTAL 8 INCH DUCT OVER THE OUTSIDE AIR DUCT AND HIGHER CEILING OF IT ROOM 108.
- 7 EXISTING MOTOR OPERATED DAMPER TO HAVE CONTROL DISCONNECTED AND THE DAMPER LOCKED IN THE FULL OPEN POSITION.
- 8 EXISTING CEILING EXHAUST FAN TO BE REMOVED AND RELOCATED TO THE CENTER OF A LAY-IN CEILING PANEL ADJACENT TO THE NEW LIGHTING FIXTURE. NOTE THAT THE DISTANCE OF THE NEW LOCATIONS IS APPROXIMATELY 12 TO 18 INCHES FROM THE PRESENT LOCATION.
- 9 EXISTING OUTSIDE AIR DAMPER TO REMAIN AND BE CONTROLLED WITH THE NEW CONTROL OCCUPIED/UNOCCUPIED SCHEDULE. REFER TO FURNACE SPECIFICATION FOR CONTROL.
- 10 TRANSITION AND CONNECT TO EXISTING F-1 SUPPLY DUCT.
- 11 DROP OUTSIDE AIR DUCT TO TOP OF NEW RETURN AIR DUCT.
- 12 CONNECT TO EXISTING 8" Ø RETURN, EXTEND AND CONNECT TO NEW 18/16.
- 13 CONNECT 12" Ø OUTSIDE AIR DUCT TO EXISTING.
- 14 CONNECT TO 8" Ø FROM ROOM 101 AND EXTEND TO F-2 22 X 12 RETURN.
- 15 CONSTRUCT A 22" X 46" PLENUM OVER 2 - RG-5 RETURN GRILLES. PLENUM TO BE HEIGHT NECESSARY TO OFFSET A 46" WIDE X 10" DUCT TO SIDE OF RESPECTIVE FURNACE RETURN DUCT, CAP END OF 10" Ø DUCT WHERE 8" Ø WAS REMOVED.
- 16 CAP END OF 10" Ø DUCT WHERE 8" Ø WAS REMOVED.
- 17 AC-1 COND. CONDENSING UNIT FOR IT ROOM COOLING. MOUNT ON WALL MOUNT FRAME SIMILAR TO ACCU-1 AND ACCU-2. SIZE FRAME FOR DIMENSIONS OF UNIT PROVIDED.
- 18 RISE REFRIGERANT LINES AND OFFSET TO AC-1 EVAPORATOR HIGH IN ROOM.
- 19 MOUNT AC-1 EVAP HIGH IN ROOM JUST BELOW THE CEILING.
- 20 RUN CONDENSATE DRAIN LINE AS HIGH AS POSSIBLE ALONG WALL, RUN THROUGH THE WALL AND DROP TO 12 INCHES ABOVE GRADE.
- 21 INSTALL DIFFUSER REMOVED FROM ROOM 105 AT THIS LOCATION,
- 22 REMOVE DIFFUSER AND RELOCATE TO ROOM 105. INSTALL NEW DIFFUSER D-2N. REDUCE BRANCH TAKEOFF TO 8" Ø
- 23 INSTALL 10" NECK DIFFUSER REMOVED FROM ROOM 102. CHANGE BRANCH DUCT SIZE FROM 6" TO 10" Ø.
- 24 REFRIGERANT LINES FOR F-1/ACCU-1 AND F-2/ACCU-2 ABOVE CEILING. DROP IN CHASE WHERE EXISTING LINES WERE REMOVED AND CONNECT TO CONDENSING UNITS.
- 25 MOUNT NEW CONDENSING UNITS ON EXISTING STEEL SUPPORT WHERE UNITS WERE REMOVED.



A FIRST FLOOR HVAC FLOOR PLAN - NEW WORK
M101 SCALE: 3/16" = 1'-0"



Architecture
Planning

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848 E. Washington Ave., Ste 112
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Engineering 370, LLC
MECHANICAL CONSULTING

Oregon, WI 53575
T: 608-225-8273

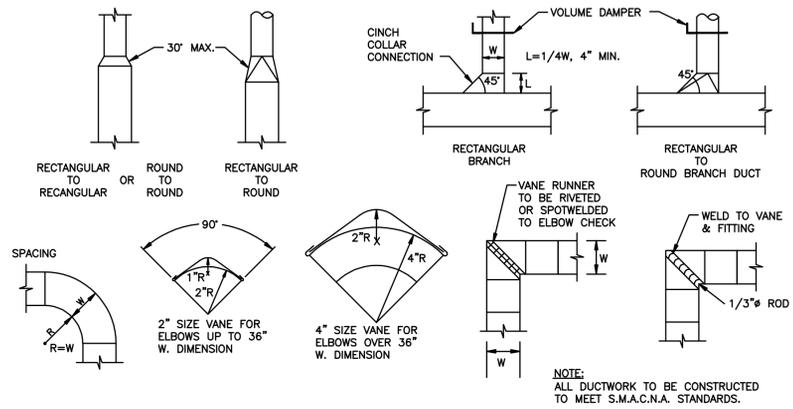
Email: info@eng370.com

Project No. 17-0302

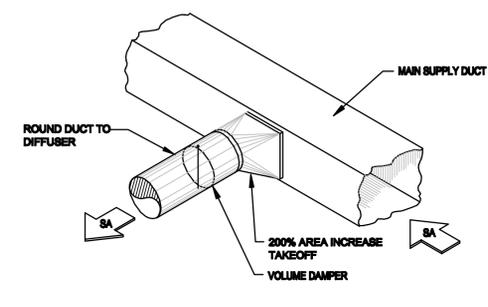
ISSUED

PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

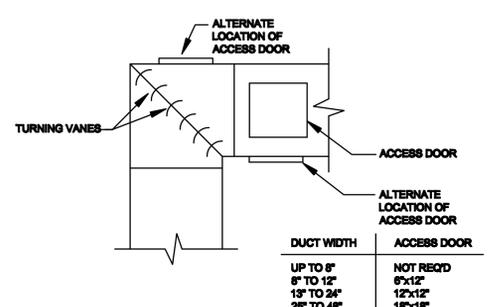
DRAWING
MECHANICAL ROOM PLAN,
HVAC SCHEDULES AND
DETAILS
DATE
04.04.2017



D GENERAL DUCT DETAILS
M102 NOT TO SCALE



C BRANCH DUCT TAKEOFF DETAIL
M102 NOT TO SCALE



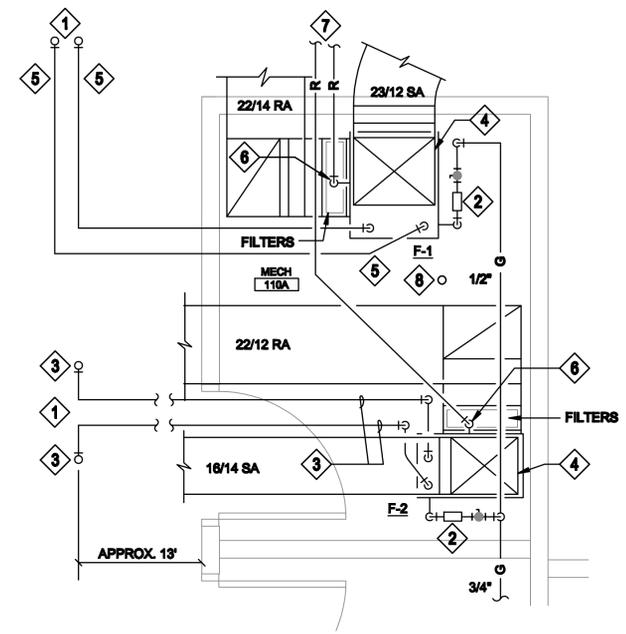
B TURNING VANE ACCESS DETAIL
M102 NOT TO SCALE

HVAC MECHANICAL ROOM GENERAL NOTES

1. THE EQUIPMENT IN THIS ROOM ARE BASED ON THE SCHEDULED CARRIER EQUIPMENT.
2. ADJUST THE DIMENSIONS TO MATCH PROVIDED EQUIPMENT IF ANOTHER MANUFACTURERS EQUIPMENT IS PROVIDED. DISCUSS CHANGES WITH THE A/E FOR APPROVAL.

HVAC MECHANICAL ROOM KEY NOTES

- 1 VERIFY EXISTING VENT AND COMBUSTION AIR INTAKE LOCATIONS THROUGH THE ROOF SERVING EXISTING FURNACES. IDENTIFY WHICH EXISTING IS INTAKE AND VENT.
- 2 REINSTALL EXISTING GAS PRESSURE REGULATOR REMOVED FROM EXISTING FURNACES WITH SAME UNIT NUMBER, F-1 OR F-2. DROP WITH UNION IN DROP PIPING, PROVIDE A TEE TO FURNACE AND DROP WITH DIRT LEG BELOW CONNECTION TO FURNACE.
- 3 RISE TO CEILING, OFFSET PAST DUCT AND RISE TO ABOVE CEILING AND DUCT WORK AND OFFSET TO EXISTING VENT AND INTAKE PIPING THROUGH ROOF AND CONNECT TO THAT PIPING. VERIFY SIZE OF NEW PIPING (2 OR 3 INCH) WITH MANUFACTURERS REQUIREMENTS. PROVIDE REQUIRED FITTINGS TO CONNECT TO EXISTING.
- 4 RISE FROM TOP OF AC COIL CASING TO ABOVE CEILING SAME SIZE AS CASING OUTLET AND OFFSET AS INDICATED.
- 5 RISE THE VENT AND COMBUSTION AIR INTAKE PIPING TO ABOVE CEILING AND DUCT WORK AND OFFSET TO EXISTING VENT AND INTAKE PIPING THROUGH ROOF AND CONNECT TO THAT PIPING. VERIFY SIZE OF NEW PIPING (2 OR 3 INCH) WITH MANUFACTURERS REQUIREMENTS. PROVIDE REQUIRED FITTINGS TO CONNECT TO EXISTING.
- 6 ROUTE NEW REFRIGERANT PIPING ABOVE CEILING FROM NEW AIR COOLED CONDENSING UNIT TO RESPECTIVE FURNACE COOLING COIL, DROP AND CONNECT TO COIL.
- 7 CONTINUE ON FIRST FLOOR PLAN A-M101.
- 8 RUN COIL AND FURNACE DRAINS TO THE FLOOR DRAIN. REFER TO PLUMBING PLAN FOR VERIFICATION.



A MECH RM PLAN - NEW WORK
M102 SCALE: 1/2" = 1'-0"

GRILLE, REGISTER, DIFFUSER SCHEDULE										
MARK	MANUFACTURER	MODEL NO.	DESCRIPTION	MATERIAL	MOUNTING	AIR PATTERN	DAMPER	NECK SIZE	ACCESSORIES	REMARKS
D-1N	CARNES	SFTB 24	LAY IN SUPPLY	STEEL	T-BAR	4 WAY	NO	6" ø		
D-2N	CARNES	SFTB 24	LAY IN SUPPLY	STEEL	T-BAR	4 WAY	NO	8" ø		
EG-5	CARNES	RATF	22X22 EGGCRATE 1/2X1/2X1	ALUM	T-BAR		NO	22X22		1

REMARKS
1 22" X 22" NECK WITH SURFACE FRAME WITH NO SCREW HOLES FOR LAY-IN INSTALLATION IN 24 X 24 CEILING GRID

AIR COOLED CONDENSING UNIT SCHEDULE																	
MARK	ASSOCIATED INDOOR UNIT	LOCATION	MFR	MODEL NO.	CAPACITY		REFRIG TYPE	AMBIENT TEMP °F	NO. OF REFRIG CIRCUITS	NO. OF COMPRESS	COMPRESS TYPE	NO. OF COND FANS	SEER	ELECTRICAL DATA			REMARKS
					NOMINAL TONS	TOTAL MBH								MCA	MAX CKT BKR	VOLTS / PHASE	
ACCU-1	F-1	SEE PLAN	CARRIER	24ABC648	4	48	R410A	95	1	1	SCROLL	1	16	26.1	40	208/1	1
ACCU-2	F-2	SEE PLAN	CARRIER	24ABC642	3.5	42	R410A	95	1	1	SCROLL	1	16	23.6	40	208/1	1

REMARKS
1 PROVIDE MATCHING COILING COIL IN COIL CASING TO BE MOUNTED ON REFERENCED FURNACE

GAS FIRED WARM AIR FURNACE																				
MARK	LOCATION	MODEL NO.	MFR	FUEL	FUEL PRESSURE MIN - MAX W.C.	GAS CONNECTION SIZE - INCHES	HEAT CAPACITY		EFFICIENCY AFUE	ESP	CFM	NOMINAL COOLING CAPACITY MBH	COOLING COIL	MOTOR TYPE	DRIVE	SPEED SELECTIONS MINIMUM	ELECTRICAL DATA			REMARKS
							INPUT BTU	OUTPUT BTU									HP	FLA	VOLTS / PHASE	
F-1	SEE PLAN	59SP5A120E	CARRIER	NAT. GAS	0.5	1/2	120,000	48	96.5	0.5	1,800	48	YES	ECM	DIRECT	4	1	10.9	120/1	1, 2, 3
F-2	SEE PLAN	59SP9A80E	CARRIER	NAT. GAS	13	1/2	80,000	42	96.5	0.5	1,400	42	YES	ECM	DIRECT	4	3/4	8.4	120/1	1, 2, 3

REMARKS
1 1/2 PSI GAS SERVICE TO BUILDING - REINSTALL GAS PRESSURE REGULATOR FROM REMOVED FURNACE
2 REGULATE GAS PRESSURE TO FURNACE INLET TO 7 INCH w.c.
3 PROVIDE COOLING COILSIZED FOR FURNACE OUTLET, MATCHING THE ASSOCIATED AIR COOLED CONDENSING UNIT

DUCTLESS SPLIT SYSTEMS AIR CONDITIONERS																		
INDOOR UNIT							OUTDOOR UNIT							REMARKS				
MARK	MFR	MODEL	DESCRIPTION	LOCATION	CFM LOW - HIGH DRY	NOMINAL CAPACITY BTUH	MARK	MFR	MODEL	LOCATION	REFRIGERANT	VOLTAGE	PHASE		MCA AMPS	MOP AMPS	LRA AMPS	SEER
AC-1	MITSUBISHI	PCA-A36KA6	WALL MOUNTED	108	775 - 990	35,000	AC-1	MITSUBISHI	PUY-A36NHA6	OUTSIDE 108	R410 A	208	1	25	40	17.5	14.4	1, 2, 3

REMARKS
1 INVERTER DRIVEN SCROLL COMPRESSOR
2 MOUNT HIGH ON WALL
3 SENSIBLE HEAT FACTOR, 0.73; SENSIBLE COOLING, 25,550 BTU

ABBREVIATIONS

AF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
BFG	BELOW FINAL GRADE
BOL	BUILT-IN OVERLOAD
C	CONDUIT
CKT	CIRCUIT
CB	COMBINATION STARTER
D	DEDICATED
DD	DOUBLE DUPLEX
EC	ELECTRICAL CONTRACTOR
EWC	ELECTRIC WATER COOLER
ER	EXISTING TO BE REMOVED
ERL	EXISTING RELOCATED (NEW LOCATION)
ETL	EXISTING TO BE RELOCATED (OLD LOCATION)
EX	EXISTING TO REMAIN
FACP	FIRE ALARM CONTROL PANEL
GC	GENERAL CONTRACTOR
GFI	GROUND FAULT INTERRUPTER
HV	HEATING AND VENTILATION CONTRACTOR
IG	ISOLATED GROUND
IR	IN ROOM
IU	IN UNIT
MAN	MANUAL STARTER
MAG	MAGNETIC STARTER
MCA	MINIMUM CIRCUIT AMPACITY
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NU	NEAR UNIT
PB	PUSHBUTTON
PC	PLUMBING CONTRACTOR
PW	PRE-WIRED
RV	REDUCED VOLTAGE STARTER
RAI	REMAIN AS IS
SC	SEPARATE CIRCUIT
SS	SPEED SWITCH
SW	SWITCH
TC	TIMECLOCK
TS	THERMOSTAT
UM	UNIT MANUFACTURER
WP	WEATHERPROOF

ELECTRICAL SYMBOLS

	LED STRIP
	LED RECESSED FIXTURE
	RECESSED FIXTURE
	WALL MOUNTED FIXTURE
	SINGLE POLE TOGGLE SWITCH (3) THREE WAY (4) FOUR WAY (K) KEY (P) PILOT LIGHT (OS) OCCUPANCY SENSOR - MOUNT 48" ABOVE FLOOR TO TOP OF BOX. LUTRON NOVA T+ OR EQUAL (UNLESS NOTED OTHERWISE) SIZED AS REQUIRED.
	WALL BOX DIMMER (3) THREE WAY (4) FOUR WAY (K) KEY (P) PILOT LIGHT (OS) OCCUPANCY SENSOR - MOUNT 48" ABOVE FLOOR TO TOP OF BOX. LUTRON NOVA T+ OR EQUAL (UNLESS NOTED OTHERWISE) SIZED AS REQUIRED.
	DUPLEX RECEPTACLE 15" ABOVE FLOOR TO BOTTOM OF BOX OR HEIGHT AS INDICATED
	DOUBLE DUPLEX RECEPTACLE 15" ABOVE FLOOR TO BOTTOM OF BOX OR HEIGHT AS INDICATED
	DUPLEX RECEPTACLE HORIZONTAL ABOVE COUNTER
	DUPLEX RECEPTACLE FLUSH IN FLOOR, OR (P) PEDESTAL MOUNTED
	TELEPHONE OUTLET FLUSH IN FLOOR, OR (P) PEDESTAL MOUNTED
	VOICE/DATA OUTLET
	SPECIAL OUTLET
	MOTOR
	DISCONNECT SWITCH
	JUNCTION BOX
	PUSHBUTTON - 52" MAX. IF SIDE ACCESSIBLE OR 48" MAX. IF FORWARD ACCESSIBLE ONLY. HEIGHT MEASURED FROM FLOOR TO TOP OF BOX.
	BELL
	OCCUPANCY SENSOR
	EMERGENCY BATTERY UNIT, WALL MOUNTED
	EMERGENCY BATTERY UNIT, CEILING MOUNTED
	CEILING MOUNTED EXIT SIGN
	WALL MOUNTED EXIT SIGN
	ELECTRICAL PANEL
	DETAIL NUMBER
	NOTE OR DETAIL SYMBOL
	SHEET LOCATION

SECURITY SYMBOLS

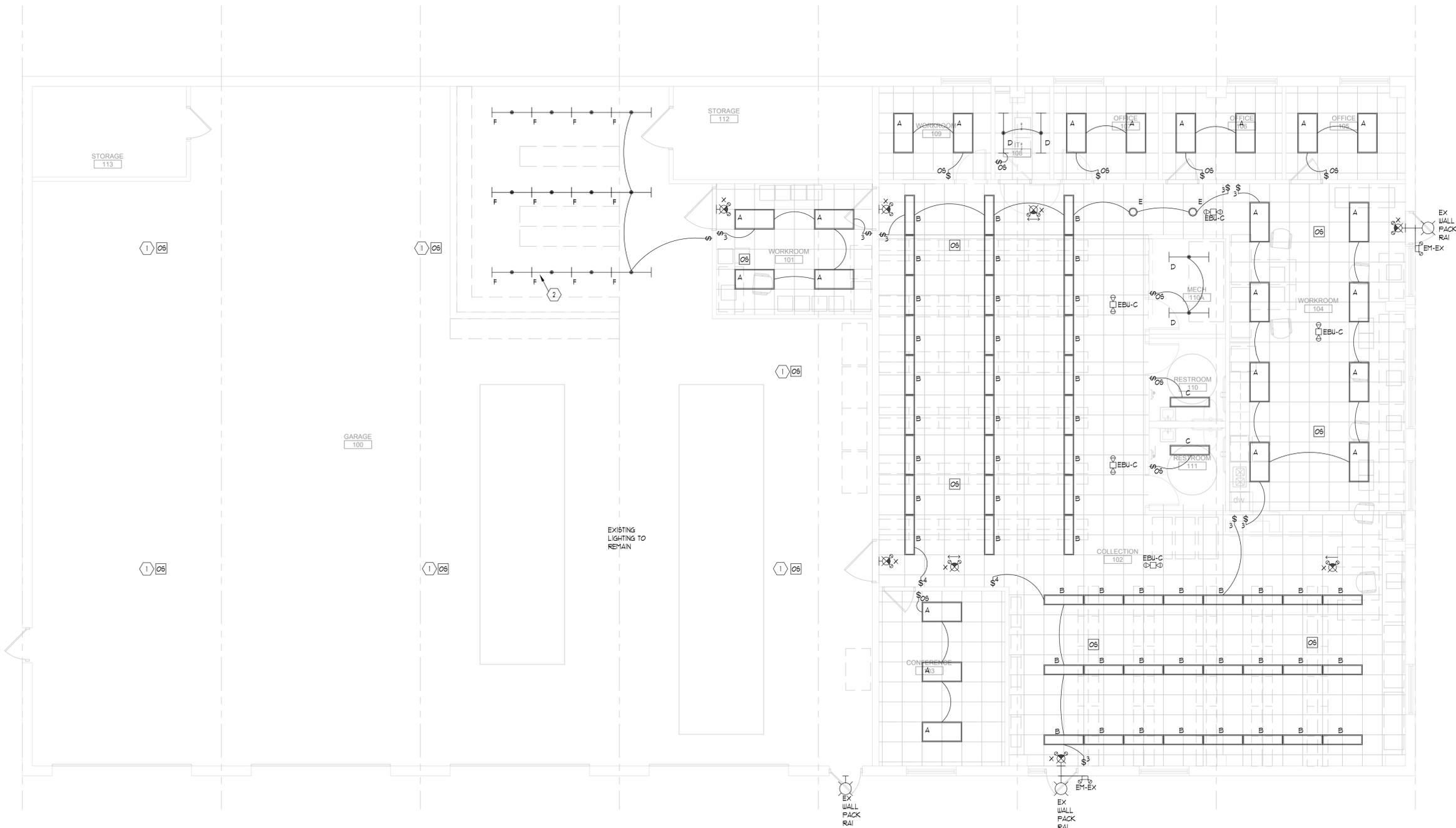
	ELECTRIC STRIKE
	CARD READER
	DOOR POSITION SWITCH
	CCTV CAMERA - PROVIDE JB WITH 3/4" C. STUBBED TO ACCESSIBLE CEILING SPACE.

FIRE ALARM SYMBOLS

	FIRE ALARM ANNUNCIATOR PANEL
	NEW FIRE ALARM FULL STATION 48" AFF
	(HORN/STROBE) (SPEAKER/STROBE) 80" AFF TO BOTTOM OF BOX OR 6" DOWN FROM CEILING TO TOP OF BOX WHICHEVER IS LOWER
	(INTELLIGENT) (CONVENTIONAL) PHOTOELECTRIC SMOKE DETECTOR
	(INTELLIGENT) (CONVENTIONAL) 125°F FIXED 4 RATE OF RISE (5°F/M) (20°F/M) UNLESS NOTED ON THE PLANS
	FIRE ALARM STROBE - ADA RATED 80" TO BOTTOM OF BOX OR 6" DOWN FROM CEILING TO TOP OF BOX WHICHEVER IS LOWER

ELECTRICAL SHEET INDEX

SHEET NUMBER	SHEET NAME
E000	SYMBOLS, ABBREVIATIONS AND SHEET INDEX
E100	LIGHTING PLAN
E200	POWER AND SYSTEMS PLAN
E300	ROOF PLAN
E400	ELECTRICAL RISER
E500	ELECTRICAL SCHEDULES
E600	ELECTRICAL DETAILS



GENERAL NOTES:

1. WIRE NEW LIGHTING TO EXISTING CIRCUITS RELEASED BY DEMOLITION.
2. WIRE BATTERY UNIT AND EXIT LIGHTS TO LIGHTING CIRCUIT SERVING AREA AHEAD OF SWITCHES.

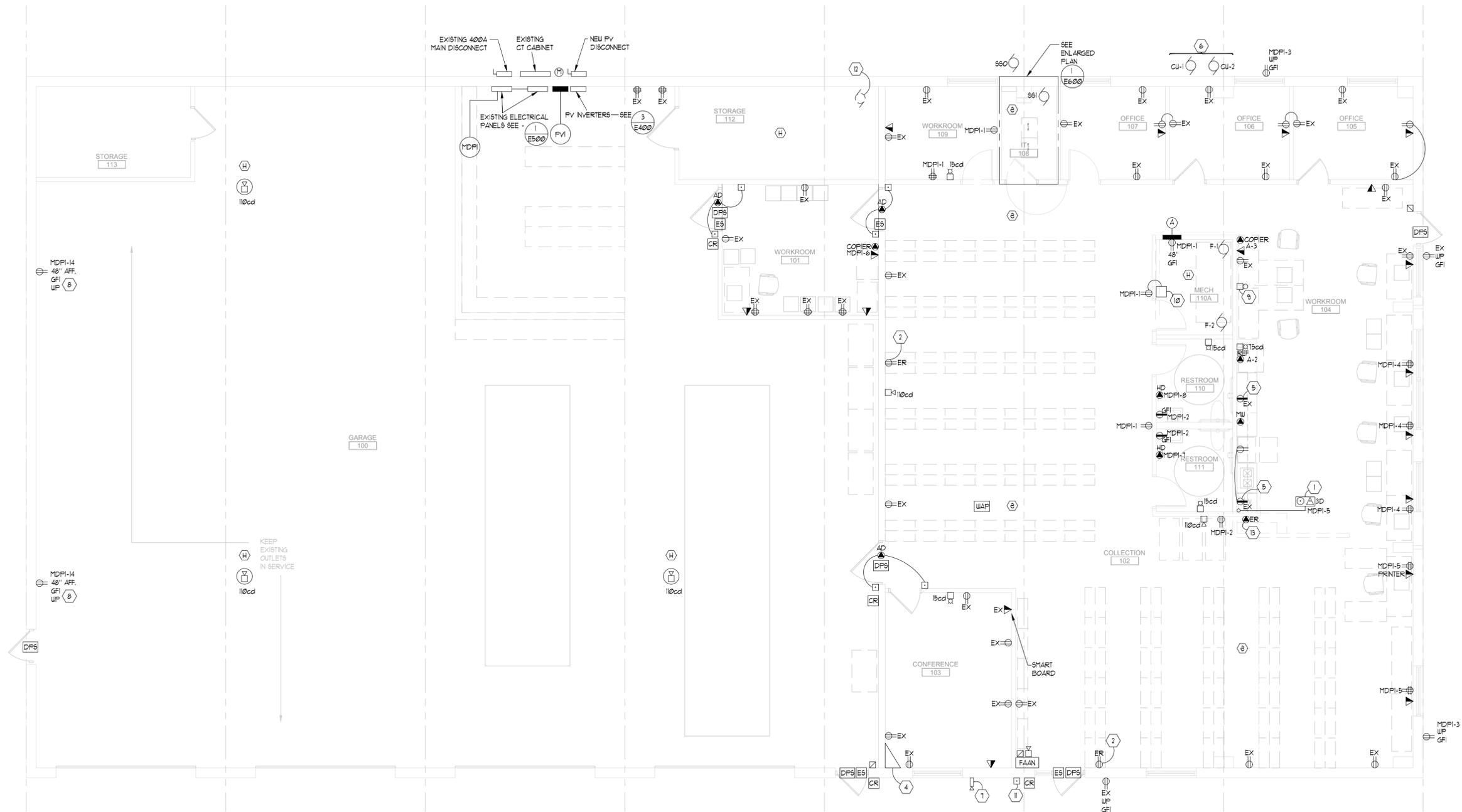
KEYED NOTES:

1. WIRE TO CONTROL EXISTING GARAGE LIGHTING.
2. REMOVE HIGH BAY FLOURESCENTS ABOVE CHAIN MOUNT 8'-0" AFF

1 FIRST FLOOR LIGHTING PLAN
3/16" = 1'-0"



C10218
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DEMOLITION NOTES:

1. VERIFY REMAINING DEMOLITION ON SITE. DANE COUNTY IS PROVIDING PARTIAL DEMOLITION.
2. REMOVE REMAINING LIGHTING, FIRE ALARM DEVICES, SPEAKERS, TV WIRING, COMMUNICATIONS WIRING, PHONE AND DATA WIRING AND REMAINING CONDUIT, BOXES, AND LIGHTING WITHIN REMODELED AREA.

KEYED NOTES:

- 1 REMOVE OUTLET ON COUNTER. CUT AND PATCH FOR NEW FLUSH FLOOR OUTLET. PROVIDE LEGRAND RFSFB-OG BOX, AND RPTCTCES COVER. EXTEND 1" CONDUIT TO ACCESSIBLE CEILING.
- 2 REMOVE RECEPTACLE. REROUTE CIRCUIT TO MAINTAIN CONTINUITY.
- 3 REMOVE WIRING FOR DISHWASHER.
- 4 KEEP CAMERA MONITOR DVR AND CAMERA POWER SUPPLY IN SERVICE.
- 5 EXTEND EXISTING OUTLET TO FACE OF BACKSPLASH.
- 6 DISCONNECT EXISTING CONDENSING UNITS. WIRE NEW CONDENSING UNITS IN SAME LOCATIONS.
- 7 RELOCATE EXISTING CAMERA CLEARING WAY FOR NEW NON-ELECTRIFIED BUILDING SIGN.
- 8 CONFIRM EXACT LOCATION WITH OWNER.
- 9 PROVIDE NATONE LAMUW DOOR CHIME WIRED TO DOOR BELL.
- 10 PROVIDE NATONE C905 DOORBELL TRANSFORMER WIRED TO CHIME AND DOORBELL.
- 11 PROVIDE BALDWIN 92R 105-001 DOORBELL WIRED TO CHIME.
- 12 DISCONNECT EXTRACTOR AND REMOVE WIRING.
- 13 DISCONNECT EXISTING DISHWASHER AND REMOVE WIRING.

GENERAL NOTES:

1. REPLACE WIRING DEVICE AND COVERPLATE FOR RECEPTACLES INDICATED "EX".



1 FIRST FLOOR POWER AND SYSTEMS PLAN

3/16" = 1'-0"

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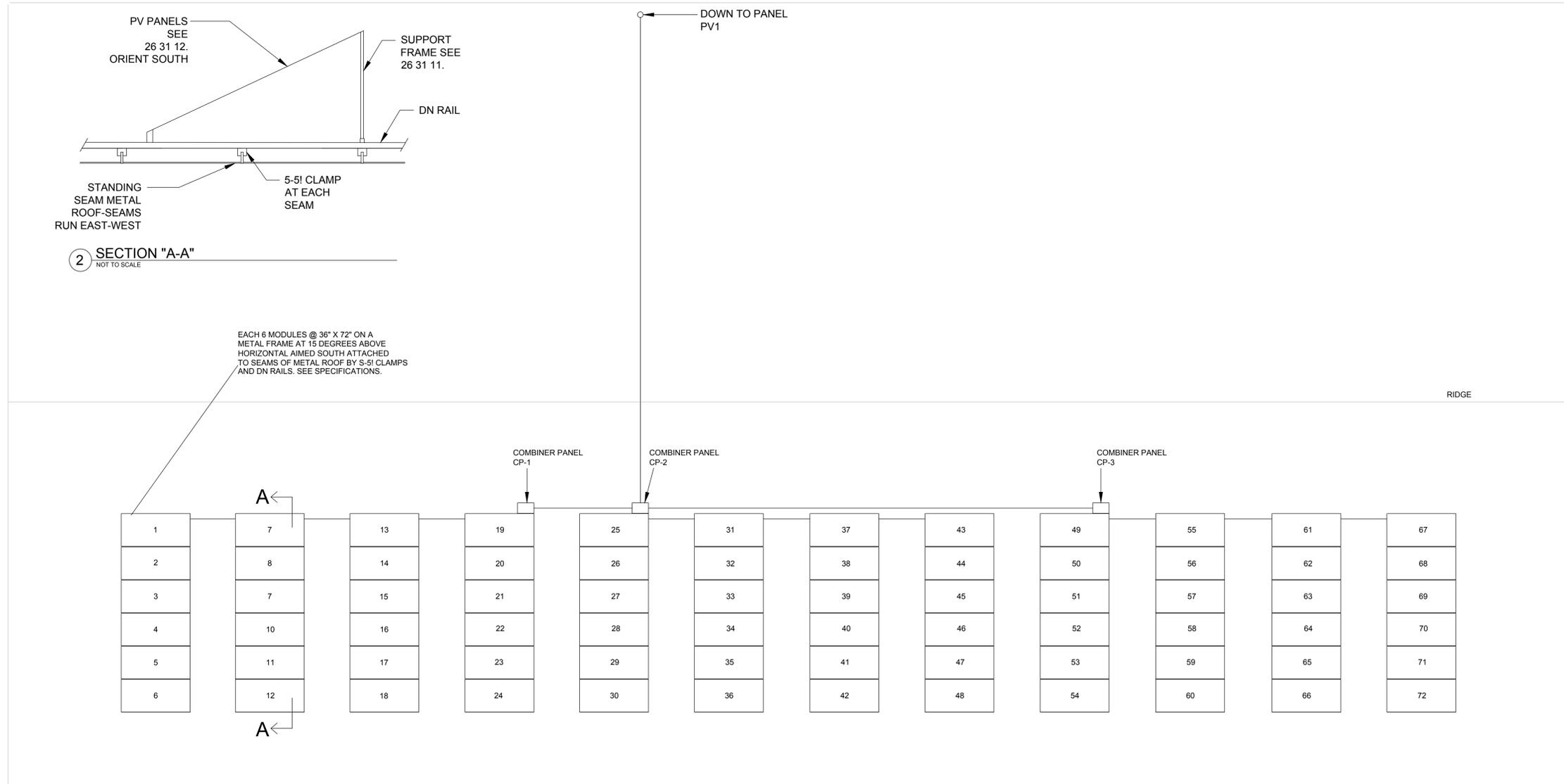
ISSUED

PROJECT
DANE COUNTY
LIBRARY SERVICE
RENOVATION

DRAWING
ROOF PLAN

DATE
04.04.17

E300



GENERAL NOTES:

1. COORDINATE RACK LOCATIONS WITH PLUMBING VENTS
2. KEEP PV PANELS 10'-0" MINIMUM FROM EDGE OF ROOF
3. ALL PHOTOVOLTAIC WIRING TO BE EXPOSED ON ROOF. RUN IN IMC ON MIRO INDUSTRIES PILLLOW BLOCK. PIPE STANDS MODEL NO. 15 MAXIMUM 1'-0" APART.

1 ROOF PLAN
3/16" = 1'-0"

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1 PANEL MD
E500 NOT TO SCALE

REUSE 20A, 1P SPARES FOR NEW CIRCUITS, ADD (1) 10A, 3P BREAKER FOR FV CIRCUIT, ADD (1) 30A, 1P AND (1) 25A, 1P FOR FURNACES, ADD (1) 30A, 2P FOR SPLIT SYSTEM, REUSE (2) 40A, 2P FOR CU-12, EXISTING PANEL IS EATON PRL1A.

LIGHT FIXTURE SCHEDULE

TAG	LAMP DATA		DESCRIPTION	LIGHTING FIXTURE		MOUNT	CEILING TYPE	VOLT	SEE NOTE
	NO	TYPE		MAKE	CATALOG NO				
A	-	40W / 3500K	2 X 4 LED FLAT PANEL LED	MAXLITE	MLFP-24EP-40-35	RECESS	GRID	120	
B	-	1800 L / 3500K	1 X 4 RECESSED INDIRECT LED	LITHONIA	AVL4-18L-MDR-EZ1-LP835	RECESS	GRID	120	
C	-	30W / 3500K	1 X 4 FLAT PANEL LED	MAXLITE	MLFP-14EP-30-3500-MLSMKFP14E-215	SURFACE	DW	120	
D	-	3000 L / 3500K	4 FOOT LED STRIP WITH LENS	LITHONIA	ZL1N-L48-FST-120-35K-90CRI-WH-HC38	CHAIN	EXP	120	
E	-	2000 L / 3500K	6" OPEN CONE LED DOWN LIGHT	GOTHAM	EVO-35-20-6AR-MWD-LD-120-EZ10	RECESS	GRID	120	
F	-	3000 L / 3500K	4 FOOT LED STRIP WITH LENS	LITHONIA	ZL1N-L48-FST-120-35K-90CRI-WH	SEE DETAIL	EXP	120	
X	-	1.5W / 9.6V	EXIT WITH EMERGENCY HEADS	LITHONIA	LHQM-LED-R-HO-SD	TOP OR BACK	GRID	120	1
EBU	2	1.5W / 3.6V	EMERGENCY BATTERY UNIT	LITHONIA	ELM2-LED-HO-EBU				
EM-EX	2	1W / 9.6V	REMOTE EMERGENCY TWIN-HEAD WEATHERPROOF	LITHONIA	ELA-LED-T-WP-M12	WALL			

NOTES:
1. WITH RESERVE CAPACITY TO POWER REMOTE HEADS.

MOTOR WIRING SCHEDULE

TAG	DRIVING	LOC.	POWER			FEED FROM	BREAKER	BRANCH WIRING			STARTER				DISCONNECT					SEE NOTE			
			HP	VOLT	PH			PANEL	CIRCUIT	SIZE	POLE	NO	SIZE	COND.	FURN.	INST.	WIRED	LOC.	TYPE		FURN.	INST.	WIRED
CU-1	AIR COOLED CONDENSING U NIT	OUTSIDE 106	19.9 FLA	208	1	MDP1	-	40	2	2 + G	10	3/4"	HV	EC	EC	IU	MAG	EC	EC	EC	NU	FD	
CU-2	AIR COOLED CONDENSING U NIT	OUTSIDE 106	17.9FLA	208	1	MDP1	-	40	2	2 + G	10	3/4"	HV	EC	EC	IU	MAG	EC	EC	EC	NU	FD	
F-1	GAS FIRED FURNACE	110A	1	120	1	MDP1	-	30	1	2 + G	12	1/2"	HV	EC	EC	IU	MAN	EC	EC	EC	NU	LMRS	
F-2	GAS FIRED FURNACE	110A	3/4	120	1	MDP1	-	25	1	2 + G	12	1/2"	HV	EC	EC	IU	MAN	EC	EC	EC	NU	LMRS	
SSI	SPLIT SYSTEM INDOOR UNIT	108				MDP1	-						HV	EC	EC	IU	MAG	EC	EC	EC	NU	LMRS	1
SSO	SPLIT SYSTEM COOLING	OUTSIDE 108	20 RLA	208	1	MDP1	-	30	2	2 + G	12	1/2"	HV	EC	EC	IU	MAG	EC	EC	EC	NU	FD	1, 2

ABBREVIATIONS:

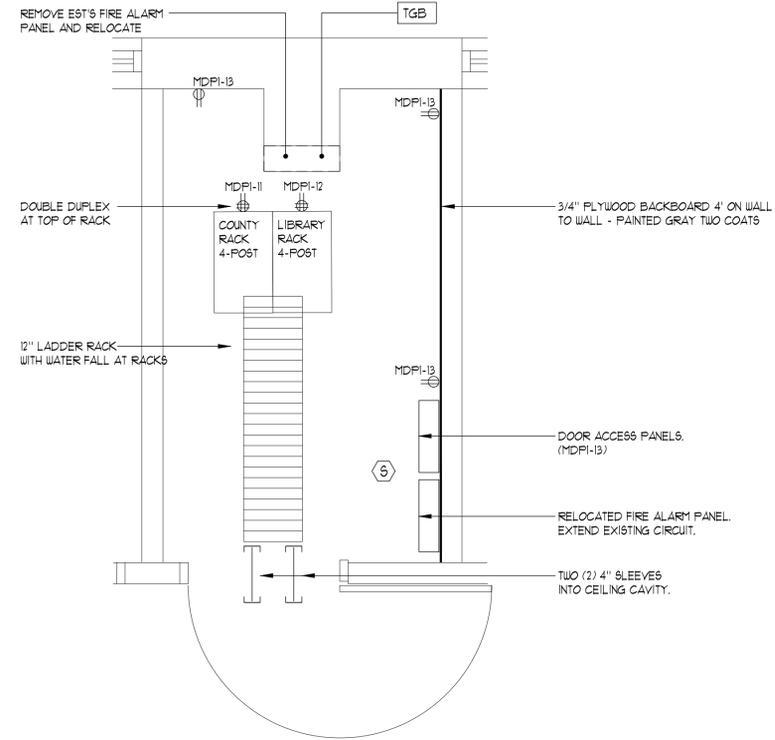
2SP = 2 SPEED MAGNETIC STARTER	HV = HVAC CONTRACTOR	HOA = HAND-OFF-AUTO	PL = PILOT LIGHT
BOL = BUILT-IN OVERLOAD	IU = IN UNIT	MCA = MINIMUM CIRCUIT AMPS	RVS = REDUCED VOLTAGE STARTER
CS = COMBINATION STARTER	LMRS = LOCKABLE MOTOR RATED SWITCH	MFR = MANUFACTURER	TCP = TEMPERATURE CONTROL PANEL
EC = ELECTRICAL CONTRACTOR	MAN = MANUAL STARTER	NFD = NON-FUSIBLE DISCONNECT	T-STAT = THERMOSTAT
ECP = ELEVATOR CONTROL PANEL	MAG = MAGNETIC STARTER	NU = NEAR UNIT	VFD = VARIABLE FREQUENCY DRIVE
EV = ELEVATOR CONTRACTOR	MC = MECHANICAL CONTRACTOR	OU = ON UNIT	WP = WEATHERPROOF
FD = FUSIBLE DISCONNECT	MCC = MOTOR CONTROL CENTER	PC = PLUMBING CONTRACTOR	STST = START/STOP

NOTES:
1. INDOOR UNIT RECEIVES POWER FROM OUTDOOR UNIT THROUGH FIELD SUPPLIED INTERCONNECTING WIRING BY ELECTRICAL CONTRACTOR.
2. ELECTRICAL CONTRACTOR TO PROVIDE CONTROL WIRING CONDUIT BETWEEN INDOOR AND OUTDOOR UNITS FOR USE BY MECHANICAL CONTRACTOR

SPECIAL PURPOSE OUTLET SCHEDULE

TAG	DRIVING	LOC.	FEED FROM			BREAKER	BRANCH WIRING			POWER			SEE NOTE
			PANEL	CIRCUIT	SIZE		POLE	NO	SIZE	COND.	VOLT	PH	
AD	AUTO DOOR OPERATOR	SEE PLAN	MDP1	9	20	1	2+G	12	1/2"	120	1	5A	
COPIER	COPIER	SEE PLAN	A	3	20	1	2+G	12	1/2"	120	1	10A	
HD	HANDDRYER	SEE PLAN	MDP1	SEE PLAN	20	1	2+G	12	1/2"	120	1	10A	
MW	MICROWAVE ON SHELF	SEE PLAN	MDP1	10	20	1	2+G	12	1/2"	120	1	10A	1
REF	REFRIGERATOR	SEE PLAN	A	2	20	1	2+G	12	1/2"	120	1	10A	1

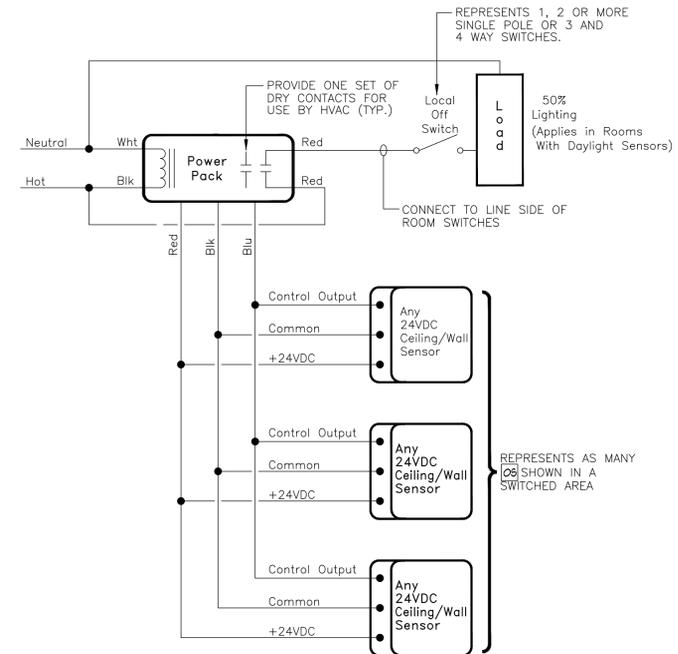
NOTES:
1. PROVIDE RECEPTACLE. PROVIDE DEAD FRONT GFI DEVICE IN ACCESSIBLE LOCATION.



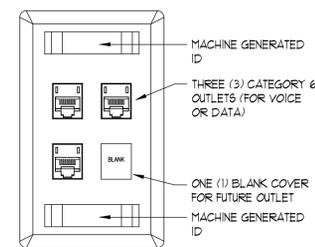
IT ROOM #108
NOT TO SCALE



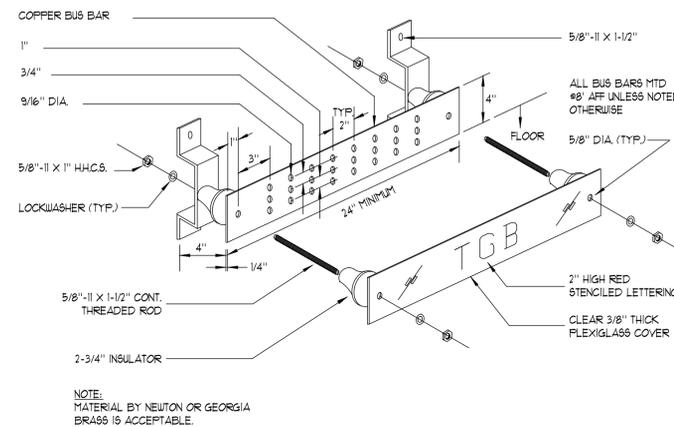
EXISTING FIRE ALARM PANEL
NOT TO SCALE



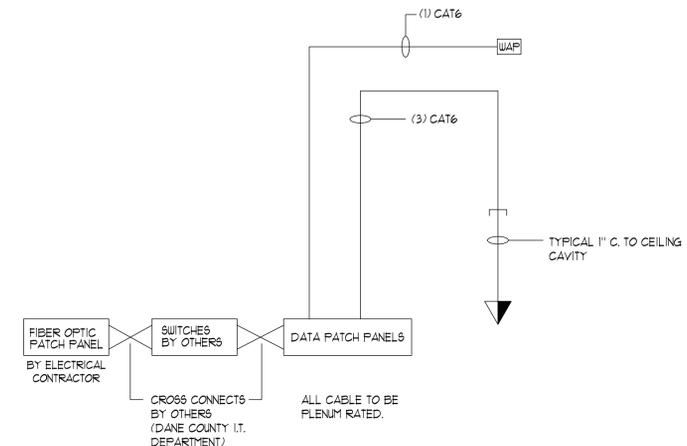
WIRING DIAGRAM - OCCUPANCY SENSORS [08]
NOT TO SCALE



TYPICAL WORKSTATION DATA OUTLET DETAIL
NO SCALE



GROUND BUS DETAIL [TGB], [MGB]
SCALE: NONE



DATA RISER DIAGRAM - CATEGORY 6 PERFORMANCE
NO SCALE