

BID OF _____

2015

PROPOSAL, CONTRACT, BOND AND SPECIFICATIONS

FOR

MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION

CONTRACT NO. 7565

PROJECT NO. 10914

MUNIS NO. 10914

IN

MADISON, DANE COUNTY, WISCONSIN

AWARDED BY THE COMMON COUNCIL
MADISON, WISCONSIN ON _____

CITY ENGINEERING DIVISION
1600 EMIL STREET
MADISON, WISCONSIN 53713

<https://bidexpress.com/login>

**MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO. 7565**

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This Proposal, and Agreement have
been prepared by:

**CITY ENGINEERING DIVISION
CITY OF MADISON
MADISON, DANE COUNTY, WISCONSIN**



Robert F. Phillips, P.E., City Engineer

RFP: jw

SECTION A: ADVERTISEMENT FOR BIDS AND INSTRUCTIONS TO BIDDERS

**REQUEST FOR BID FOR PUBLIC WORKS CONSTRUCTION
CITY OF MADISON, WISCONSIN**

A BEST VALUE CONTRACTING MUNICIPALITY

PROJECT NAME:	MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO.:	7565
SBE GOAL	10%
BID BOND	5%
PRE BID MEETING (1:00 P.M.)	OCTOBER 30, 2015
PREQUALIFICATION APPLICATION DUE (1:00 P.M.)	OCTOBER 30, 2015
BID SUBMISSION (1:00 P.M.)	NOVEMBER 6, 2015
BID OPEN (1:30 P.M.)	NOVEMBER 6, 2015
PUBLISHED IN WSJ	OCT. 23 & 30, 2015

PRE BID MEETING: Representatives of the Affirmative Action Department will be present to discuss the Small Business Enterprise requirements at 1600 Emil Street, Madison Wisconsin.

QUESTIONS AND CLARIFICATIONS: Any questions or requests for clarifications regarding plans and specifications shall be submitted directly to the Project Architect See the contract contact information at the end of Section D-Special Provisions. All questions shall be sent via email, reference Monona Terrace Roof Garden Restrooms Alteration in the subject line.

PREQUALIFICATION APPLICATION: Forms are available on our website, www.cityofmadison.com/business/pw/forms.cfm. If not currently prequalified in the categories listed in Section A, an amendment to your Prequalification will need to be submitted prior to the same due date. Postmark is not applicable.

BIDS TO BE SUBMITTED by hand to 1600 EMIL ST., MADISON, WI 53713 or online at www.bidexpress.com.

THE BID OPENING is at 1600 EMIL ST., MADISON, WI 53713.

STANDARD SPECIFICATIONS

The City of Madison's Standard Specifications for Public Works Construction - 2015 Edition, as supplemented and amended from time to time, forms a part of these contract documents as if attached hereto.

These standard specifications are available on the City of Madison Public Works website, www.cityofmadison.com/Business/PW/specs.cfm.

The Contractor shall review these Specifications prior to preparation of proposals for the work to be done under this contract, with specific attention to Article 102, "BIDDING REQUIREMENTS AND CONDITIONS" and Article 103, "AWARD AND EXECUTION OF THE CONTRACT." For the convenience of the bidder, below are highlights of three subsections of the specifications.

SECTION 102.1: PRE-QUALIFICATION OF BIDDERS

In accordance with Wisconsin State Statutes 66.0901 (2) and (3), all bidders must submit to the Board of Public Works proof of responsibility on forms furnished by the City. The City requires that all bidders be qualified on a biennial basis.

Bidders must present satisfactory evidence that they have been regularly engaged in the type of work specified herein and they are fully prepared with necessary capital, materials, machinery and supervisory personnel to conduct the work to be contracted for to the satisfaction of the City. All bidders must be pre-qualified by the Board of Public Works for the type of construction on which they are bidding prior to the opening of the bid.

In accordance with Section 39.02(9)(a)l. of the General Ordinances, all bidders shall submit in writing to the Affirmative Action Division Manager of the City of Madison, a Certificate of Compliance or an Affirmative Action Plan at the same time or prior to the submission of the proof of responsibility forms.

The bidder shall be disqualified if the bidder fails to or refuses to, prior to opening of the bid, submit a Certificate of compliance, Affirmative Action Plan or Affirmative Action Data Update, as applicable, as defined by Section 39.02 of the General Ordinances (entitled Affirmative Action) and as required by Section 102.11 of the Standard Specifications.

SECTION 102.4 PROPOSAL

No bid will be accepted that does not contain an adequate or reasonable price for each and every item named in the Schedule of Unit Prices.

A lump sum bid for the work in accordance with the plans and specifications is required. The lump sum bid must be the same as the total amounts bid for the various items and it shall be inserted in the space provided.

All papers bound with or attached to the proposal form are considered a part thereof and must not be detached or altered when the proposal is submitted. The plans, specifications and other documents designated in the proposal form will be considered a part of the proposal whether attached or not.

A proposal submitted by an individual shall be signed by the bidder or by a duly authorized agent. A proposal submitted by a partnership shall be signed by a member/partner or by a duly authorized agent thereof. A proposal submitted by a corporation shall be signed by an authorized officer or duly authorized registered agent of such corporation, and the proposal shall show the name of the State under the laws of which such corporation was chartered. The required signatures shall in all cases appear in the space provided thereof on the proposal.

Each proposal shall be placed, together with the proposal guaranty, in a sealed envelope, so marked as to indicate name of project, the contract number or option to which it applies, and the name and address of the Contractor or submitted electronically through Bid Express (www.bidexpress.com). Proposals will be accepted at the location, the time and the date designated in the advertisement. Proposals received after the time and date designated will be returned to the bidder unopened.

The Bidder shall execute the Disclosure of Ownership form. REFER TO SECTION F.

SECTION 102.5: BID DEPOSIT (PROPOSAL GUARANTY)

All bids, sealed or electronic, must be accompanied with a Bid Bond equal to at least 5% of the bid or a Certificate of Annual/Biennial Bid Bond or certified check, payable to the City Treasurer. Bid deposit of the successful bidders shall be returned within forty-eight (48) hours following execution of the contract and bond as required.

PREVAILING WAGE RATES

Prevailing Wage Rates may be required and are attached in Section J of the contract. See Special Provisions to determine applicability.

Bidders for this Contract(s) must be Pre-Qualified for at least one of the following type(s) of construction denoted by an

Building Demolition

- 101 Asbestos Removal
- 120 House Mover

- 110 Building Demolition

Street, Utility and Site Construction

- 201 Asphalt Paving
- 205 Blasting
- 210 Boring/Pipe Jacking
- 215 Concrete Paving
- 220 Con. Sidewalk/Curb & Gutter/Misc. Flat Work
- 221 Concrete Bases and Other Concrete Work
- 222 Concrete Removal
- 225 Dredging
- 230 Fencing
- 235 Fiber Optic Cable/Conduit Installation
- 240 Grading and Earthwork
- 241 Horizontal Saw Cutting of Sidewalk
- 242 Infrared Seamless Patching
- 245 Landscaping, Maintenance
- 250 Landscaping, Site and Street
- 251 Parking Ramp Maintenance
- 252 Pavement Marking
- 255 Pavement Sealcoating and Crack Sealing
- 260 Petroleum Above/Below Ground Storage Tank Removal/Installation
- 262 Playground Installer
- 265 Retaining Walls, Precast Modular Units

- 270 Retaining Walls, Reinforced Concrete
- 275 Sanitary, Storm Sewer and Water Main Construction
- 276 Sawcutting
- 280 Sewer Lateral Drain Cleaning/Internal TV Insp.
- 285 Sewer Lining
- 290 Sewer Pipe Bursting
- 295 Soil Borings
- 300 Soil Nailing
- 305 Storm & Sanitary Sewer Laterals & Water Svc.
- 310 Street Construction
- 315 Street Lighting
- 318 Tennis Court Resurfacing
- 320 Traffic Signals
- 325 Traffic Signing & Marking
- 332 Tree pruning/removal
- 333 Tree, pesticide treatment of
- 335 Trucking
- 340 Utility Transmission Lines including Natural Gas, Electrical & Communications
- 399 Other _____

Bridge Construction

- 501 Bridge Construction and/or Repair

Building Construction

- 401 Floor Covering (including carpet, ceramic tile installation, rubber, VCT)
- 402 Building Automation Systems
- 403 Concrete
- 404 Doors and Windows
- 405 Electrical - Power, Lighting & Communications
- 410 Elevator - Lifts
- 412 Fire Suppression
- 413 Furnishings - Furniture and Window Treatments
- 415 General Building Construction, Equal or Less than \$250,000
- 420 General Building Construction, \$250,000 to \$1,500,000
- 425 General Building Construction, Over \$1,500,000
- 428 Glass and/or Glazing
- 429 Hazardous Material Removal
- 430 Heating, Ventilating and Air Conditioning (HVAC)
- 433 Insulation - Thermal
- 435 Masonry/Tuck pointing

- 437 Metals
- 440 Painting and Wallcovering
- 445 Plumbing
- 450 Pump Repair
- 455 Pump Systems
- 460 Roofing and Moisture Protection
- 464 Tower Crane Operator
- 461 Solar Photovoltaic/Hot Water Systems
- 465 Soil/Groundwater Remediation
- 466 Warning Sirens
- 470 Water Supply Elevated Tanks
- 475 Water Supply Wells
- 480 Wood, Plastics & Composites - Structural & Architectural
- 499 Other _____

State of Wisconsin Certifications

- 1 Class 5 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for quarries, open pits and road cuts.
- 2 Class 6 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for trenches, site excavations, basements, underwater demolition, underground excavations, or structures 15 feet or less in height.
- 3 Class 7 Blaster - Blasting Operations and Activities for structures greater than 15' in height, bridges, towers, and any of the objects or purposes listed as "Class 5 Blaster or Class 6 Blaster".
- 4 Petroleum Above/Below Ground Storage Tank Removal and Installation (Attach copies of State Certifications.)
- 5 Hazardous Material Removal (Contractor to be certified for asbestos and lead abatement per the Wisconsin Department of Health Services, Asbestos and Lead Section (A&LS).) See the following link for application: www.dhs.wisconsin.gov/Asbestos/Cert. State of Wisconsin Performance of Asbestos Abatement Certificate must be attached.
- 6 Certification number as a Certified Arborist or Certified Tree Worker as administered by the International Society of Arboriculture
- 7 Pesticide application (Certification for Commercial Applicator For Hire with the certification in the category of turf and landscape (3.0) and possess a current license issued by the DATCP)
- 8 State of Wisconsin Master Plumbers License.

SECTION B: PROPOSAL

Please refer to the
Bid Express Website
at <https://bidexpress.com>
look up contract number
and go to
Section B: Proposal Page

You can access all City of Madison bid solicitations for FREE at www.bidexpress.com

Click on the "Register for Free" button and follow the instructions to register your company and yourself. You will be asked for a payment subscription preference, since you may wish to bid online someday. Simply choose the method to pay on a 'per bid' basis. This requires no payment until / unless you actually bid online. You can also choose the monthly subscription plan at this time. You will, however, be asked to provide payment information. Remember, you can change your preference at anytime. You will then be able to complete your free registration and have full access to the site. Your free access does not require completion of the 'Digital ID' process, so you will have instant access for viewing and downloading. To be prepared in case you ever do wish to bid online, you may wish to establish your digital ID also, since you cannot bid without a Digital ID.

If you have any problems with the free registration process, you can call the bidexpress help team, toll free at 1-888-352-2439 (option 1, option1).

SECTION C: SMALL BUSINESS ENTERPRISE

Instructions to Bidders City of Madison SBE Program Information

2 Small Business Enterprise (SBE) Program Information

2.1 Policy and Goal

The City of Madison reaffirms its policy of nondiscrimination in the conduct of City business by maintaining a procurement process which remains open to all who have the potential and ability to sell goods and services to the City. It is the policy of the City of Madison to allow Small Business Enterprises (SBE) maximum feasible opportunity to participate in City of Madison contracting. The bidder acknowledges that its bid has been submitted in accordance with the SBE program and is for the public's protection and welfare.

Please refer to the "ADVERTISEMENT FOR BIDS" for the goal for the utilization of SBEs on this project. SBEs may participate as subcontractors, vendors and/or suppliers, which provide a commercially useful function. The dollar value for SBE suppliers or 'materials only' vendors shall be discounted to 60% for purposes of meeting SBE goals.

A bidder which achieves or exceeds the SBE goal will be in compliance with the SBE requirements of this project. In the event that the bidder is unable to achieve the SBE goal, the bidder must demonstrate that a good faith effort to do so was made. Failure to either achieve the goal or demonstrate a good faith effort to do so will be grounds for the bidder being deemed a non-responsible contractor ineligible for award of this contract.

A bidder may count towards its attainment of the SBE goal only those expenditures to SBEs that perform a commercially useful function. For purposes of evaluating a bidder's responsiveness to the attainment of the SBE goal, the contract participation by an SBE is based on the percentage of the total base bid proposed by the Contractor. The total base bid price is inclusive of all addenda.

Work performed by an SBE firm in a particular transaction can be counted toward the goal only if it involves a commercially useful function. That is, in light of industry practices and other relevant considerations, does the SBE firm have a necessary and useful role in the transaction, of a kind for which there is a market outside the context of the SBE Program, or is the firm's role a superfluous step added in an attempt to obtain credit towards goals? If, in the judgment of the Affirmative Action Division, the SBE firm will not perform a commercially useful function in the transaction, no credit towards goals will be awarded.

The question of whether a firm is performing a commercially useful function is completely separate from the question of whether the firm is an eligible SBE. A firm is eligible if it meets the definitional criteria and ownership and control requirements, as set forth in the City of Madison's SBE Program.

If the City of Madison determines that the SBE firm is performing a commercially useful function, then the City of Madison must then decide what that function is. If the commercially useful function is that of an SBE vendor / supplier that regularly transacts business with the respective product, then the City of Madison will count 60% of the value of the product supplied toward SBE goals.

To be counted, the SBE vendor / supplier must be engaged in selling the product in question to the public. This is important in distinguishing an SBE vendor / supplier, which has a regular trade with a variety of customers, from a firm which performs supplier-like functions on an ad hoc basis or for only one or two contractors with whom it has a special relationship.

A supplier of bulk goods may qualify as an eligible SBE vendor / supplier if it either maintains an inventory or owns or operates distribution equipment. With respect to the distribution equipment; e.g., a fleet of trucks, the term "operates" is intended to cover a situation in which the supplier leases the equipment on a regular basis for its entire business. It is not intended to cover a situation in which the firm simply provides drivers for trucks owned or leased by another party; e.g., a prime contractor, or leases such a party's trucks on an ad hoc basis for a specific job.

If the commercially useful function being performed is not that of a qualified SBE vendor / supplier, but rather that of delivery of products, obtaining bonding or insurance, procurement of personnel, acting as a broker or manufacturer's representative in the procurement of supplies, facilities, or materials, etc., only the fees or commissions will apply towards the goal.

For example, a business that simply transfers title of a product from manufacturer to ultimate purchaser; e. g., a sales representative who re-invoices a steel product from the steel company to the Contractor, or a firm that puts a product into a container for delivery would not be considered a qualified SBE vendor / supplier. The Contractor would not receive credit based on a percentage of the cost of the product for working with such firms.

Concerning the use of services that help the Contractor obtain needed supplies, personnel, materials or equipment to perform a contract: only the fee received by the service provider will be counted toward the goal. For example, use of a SBE sales representative or distributor for a steel company, if performing a commercially useful function at all, would entitle the Contractor receiving the steel to count only the fee paid to the representative or distributor toward the goal. This provision would also govern fees for professional and other services obtained expressly and solely to perform work relating to a specific contract.

Concerning transportation or delivery services: if an SBE trucking company picks up a product from a manufacturer or a qualified vendor / supplier and delivers the product to the Contractor, the commercially useful function it is performing is not that of a supplier, but simply that of a transporter of goods. Unless the trucking company is itself the manufacturer or a qualified vendor / supplier in the product, credit cannot be given based on a percentage of the cost of the product. Rather, credit would be allowed for the cost of the transportation service.

The City is aware that the rule's language does not explicitly mention every kind of business that may contribute work on this project. In administering these programs, the City would, on a case-by-case basis, determine the appropriate counting formula to apply in a particular situation.

2.2 Contract Compliance

Questions concerning the SBE Program shall be directed to the Contract Compliance Officer of the City of Madison Department of Civil Rights, Affirmative Action Division, 210 Martin Luther King, Jr. Blvd., Room 523, Madison, WI 53703; telephone (608) 266-4910.

2.3 Certification of SBE by City of Madison

The Affirmative Action Division maintains a directory of SBEs which are currently certified as such by the City of Madison. Contact the Contract Compliance Officer as indicated in Section 2.2 to receive a copy of the SBE Directory or you may access the SBE Directory online at www.cityofmadison.com/dcr/aaTBDir.cfm.

All contractors, subcontractors, vendors and suppliers seeking SBE status must complete and submit the **Targeted Business Certification Application** to the City of Madison Affirmative Action Division by the time and date established for receipt of bids. A copy of the Targeted Business Certification Application is available by contacting the Contract Compliance Officer at the address and telephone indicated in Section 2.2 or you may access the Targeted Business Certification Application online at www.cityofmadison.com/dcr/aaTBDir.cfm. Submittal of the Targeted Business Certification Application by the time specified does not guarantee that the applicant will be certified as a SBE eligible to be utilized towards meeting the SBE goal for this project.

2.4 Small Business Enterprise Compliance Report

2.4.1 Good Faith Efforts

Bidders shall take all necessary affirmative steps to assure that SBEs are utilized when possible and that the established SBE goal for this project is achieved. A contractor who self performs a portion of the work, and is pre-qualified to perform that category of work, may subcontract that portion of the work, but shall not be required to do so. When a bidder is unable to achieve the established SBE goal, the bidder must demonstrate that a good faith effort to do so was made. Such a good faith effort should include the following:

- 2.4.1.1 Attendance at the pre-bid meeting.
- 2.4.1.2 Using the City of Madison's directory of certified SBEs to identify SBEs from which to solicit bids.
- 2.4.1.3 Assuring that SBEs are solicited whenever they are potential sources.
- 2.4.1.4 Referring prospective SBEs to the City of Madison Affirmative Action Division for certification.
- 2.4.1.5 Dividing total project requirements into smaller tasks and/or quantities, where economically feasible, to permit maximum feasible SBE participation.
- 2.4.1.6 Establishing delivery schedules, where requirements permit, which will encourage participation by SBEs.
- 2.4.1.7 Providing SBEs with specific information regarding the work to be performed.
- 2.4.1.8 Contacting SBEs in advance of the deadline to allow such businesses sufficient time to prepare a bid.
- 2.4.1.9 Utilizing the bid of a qualified and competent SBE when the bid of such a business is deemed reasonable (i.e. 5% above the lowest bidder), although not necessarily low.
- 2.4.1.10 Contacting SBEs which submit a bid, to inquire about the details of the bid and confirm that the scope of the work was interpreted as intended.

2.4.2 Reporting SBE Utilization and Good Faith Efforts

The Small Business Enterprise Compliance Report is to be submitted by the bidder with the bid: This report is due by the specified bid closing time and date. Bids submitted without a completed SBE Compliance Report as outlined below

shall be deemed non-responsible and the bidder ineligible for award of this contract.

2.4.2.1 If the Bidder meets or exceeds the goal established for SBE utilization, the Small Business Enterprise Compliance Report shall consist of the following:

2.4.2.1.1 **Cover Page**, Page C-6; and

2.4.2.1.2 **Summary Sheet**, C-7.

2.4.2.2 If the bidder does not meet the goal established for SBE utilization, the Small Business Enterprise Compliance Report shall consist of the following:

2.4.2.2.1 **Cover Page**, Page C-6;

2.4.2.2.2 **Summary Sheet**, C-7; and

2.4.2.2.3 **SBE Contact Report**, C-8 and C-9. (A separate Contact Report must be completed for each applicable SBE which is not utilized.)

2.5 Appeal Procedure

A bidder which does not achieve the established goal and is found non-responsible for failure to demonstrate a good faith effort to achieve such goal and subsequently denied eligibility for award of contract may appeal that decision to the Small Business Enterprises Appeals Committee. All appeals shall be made in writing, and shall be delivered to and received by the City Engineer no later than 4:30 PM on the third business day following the bidder's receipt of the written notification of ineligibility by the Affirmative Action Division Manager. Postmark not acceptable. The notice of appeal shall state the basis for the appeal of the decision of the Affirmative Action Division Manager. The Appeal shall take place in accordance with Madison General Ordinance 33.54.

2.6 SBE Requirements After Award of the Contract

The successful bidder shall identify SBE subcontractors, suppliers and vendors on the subcontractor list in accordance with the specifications. The Contractor shall submit a detailed explanation of any variances between the listing of SBE subcontractors, vendors and/or suppliers on the subcontractor list and the Contractor's SBE Compliance Report for SBE participation.

No change in SBE subcontractors, vendors and/or suppliers from those SBEs indicated in the SBE Compliance Report will be allowed without prior approval from the Engineer and the Affirmative Action Division. The contractor shall submit in writing to the City of Madison Affirmative Action Division a request to change any SBE citing specific reasons which necessitate such a change. The Affirmative Action Division will use a general test of reasonableness in approving or rejecting the contractor's request for change. If the request is approved, the Contractor will make every effort to utilize another SBE if available.

The City will monitor the project to ensure that the actual percentage commitment to SBE firms is carried out.

2.7 SBE Definition and Eligibility Guidelines

A Small Business Enterprise is a business concern awarded certification by the City of Madison. For the purposes of this program a Small Business Enterprise is defined as:

- A. An independent business operated under a single management. The business may not be a subsidiary of any other business and the stock or ownership may not be held by any individual or any business operating in the same or a similar field. In determining whether an entity qualifies as a SBE, the City shall consider all factors relevant to being an independent business including, but not limited to, the date the business was established, adequacy of its resources for the work in which it proposes to involve itself, the degree to which financial, equipment leasing and other relationships exist with other ineligible firms in the same or similar lines of work. SBE owner(s) shall enjoy the customary incidents of ownership and shall share in the risks and profits commensurate with their enjoyment interests, as demonstrated by an examination of the substance rather than form or arrangements that may be reflected in its ownership documents.
- B. A business that has averaged no more than \$4.0 million in annual gross receipts over the prior three year period and the principal owner(s) do not have a personal net worth in excess of \$1.32 million.

Firm and/or individuals that submit fraudulent documents/testimony may be barred from doing business with the City and/or forfeit existing contracts.

SBE certification is valid for one (1) year unless revoked.

**MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO. 7565**

Small Business Enterprise Compliance Report

**This information may be submitted electronically through
Bid Express or submitted with bid in sealed envelope.**

Cover Sheet

Prime Bidder Information

Company: _____

Address: _____

Telephone Number: _____ Fax Number: _____

Contact Person/Title: _____

Prime Bidder Certification

I, _____, _____ of
Name Title
_____ certify that the information
Company

contained in this SBE Compliance Report is true and correct to the best of my knowledge and belief.

Witness' Signature

Bidder's Signature

Date

**MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO. 7565**

Small Business Enterprise Compliance Report

SBE Contact Report

Submit separate copy of this form for each SBE which you are not able to utilize towards meeting the SBE goal for this project. Attach separate sheets if necessary.

SBE Information

Company: _____

Address: _____

Telephone Number: _____

Contact Person/Title: _____

1. Outline below all efforts to solicit a bid from the above SBE. Include date, means of contact, who from your company made this contact and the result.

2. Describe the information provided to the aforementioned SBE regarding the scope of work for which he/she was to provide a bid.

Is this the same scope of work on which the subcontractor you intend to utilize based his/her bid?

Yes No

3. Did this SBE submit a bid? Yes No

4. Is the General Contractor pre-qualified to self-perform this category of work?

Yes No

5. If you responded "Yes" to Question 3, please check the items below which apply and provide the requested detail. If you responded "No" to Question 3, please skip ahead to item 6 below.

The SBE listed above is unavailable for work on this project for the following reasons. Provide specific detail for this conclusion.

The SBE listed above is unqualified for work on this project. Provide specific details for this conclusion.

The SBE listed above provided a price that was unreasonable (i.e. more than 5% above the lowest bidder). Provide specific detail for this conclusion including the SBE's price and the price of the subcontractor you intend to utilize.

A contract with the SBE listed above may constitute a breach of the bidder's collective bargaining agreements. Provide specific detail for this conclusion including, but not limited to, correspondence from the SBE indicating it will not sign a project labor agreement and/or correspondence from the applicable trade union indicating a project labor agreement will not be allowed at the time of project bidding.

Other; please specify reason(s) other than listed above which made it impossible for you to utilize this SBE on this project.

6. Describe any other good faith efforts:

SECTION D: SPECIAL PROVISIONS

MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION CONTRACT NO. 7565

It is the intent of these Special Provisions to set forth the final contractual intent as to the matter involved and shall prevail over the Standard Specifications and plans whenever in conflict therewith. In order that comparisons between the Special Provisions can be readily made, the numbering system for the Special Provisions is equivalent to that of the Specifications.

Whenever in these Specifications the term "Standard Specifications" appears, it shall be taken to refer to the City of Madison Standard Specifications for Public Works Construction and Supplements thereto.

SECTION 102.10: PREVAILING WAGE

For this project, payment of prevailing wages (white sheet) shall be required unless the box indicating prevailing wages are not required is checked below.

Prevailing wages shall not be required when this box is checked.

If prevailing wages (white sheets) are required, the wages and benefits paid on the contract shall not be less than those specified in the Prevailing Wage Determination included with these contract documents for the following types of work:

- Building or Heavy Construction
- Sewer, Water, or Tunnel Construction
- Local Street or Miscellaneous Paving Construction
- Residential or Agricultural Construction

When multiple boxes are checked, worker's wages may vary according to the type and area of work performed. It is the responsibility of the Contractor to determine and apply the appropriate wage rate for the specific work assigned.

SECTION 102.12: BEST VALUE CONTRACTING

This Contract shall be considered a Best Value Contract if the Contractor's bid is equal to or greater than \$55,500 for a single trade contract; or equal to or greater than \$271,500 for a multi-trade contract pursuant to MGO 33.07(7).

ARTICLE 103: AWARD AND EXECUTION OF THE CONTRACT

The awarded Contractor shall completely execute the signing of all contract documents and submit them to City Engineering prior to **12:00pm on December 2, 2015**. No exceptions or extensions to the above date will be permitted.

ARTICLE 104: SCOPE OF WORK

This contract is to remodel existing restrooms on the roof garden level at Monona Terrace Community & Convention Center. The project is to remodel the west side women's and men's restrooms on the roof garden level of around 575 square feet, and the east side women's and men's restrooms of around 330 square feet. The remodel will accommodate additional toilet stalls and it will include upgrading of plumbing fixtures, lighting fixtures, and interior finishes.

The scope of work includes the furnishing of all labor, materials, equipment, tools, and other services necessary to complete the work in accordance with the intent of this contract. The Contractor shall use properly functioning equipment capable of performing the tasks required. The Contractor shall furnish workers who perform quality work and who are experienced and knowledgeable in the work proposed.

SECTION 104.1: LANDS FOR WORK

Lands for work shall include all of the following:

- Existing west and east roof garden restrooms.

SECTION 104.2: INTENT AND COORDINATION OF CONTRACT DOCUMENTS

The contract documents are complimentary of each other and consist of all of the following:

- The City Standard Specification, 2015 Edition
- These Special Provisions including all plans and specifications as noted by the exhibits list below
- All Addendums to the bidding documents
- Any supplemental instructions, details, or specifications issued during the course of the contract.
- The following exhibits are for bidding purposes, all exhibits are PDF readable files.
 - Exhibit A – Construction Document Plan Sheets including Architectural, Fire Protection, Plumbing, HVAC, and Electrical.
 - Exhibit B – Written Specifications (assembled at the end of the Special Provisions)

SECTION 105.5: INSPECTION OF WORK

The Contractor shall coordinate directly with any and all regulatory agencies having jurisdiction over the licensing, permitting, and inspection, of work as described in these construction documents.

The Contractor shall be familiar with Specification 01 45 16-Field Quality Control Procedures regarding City of Madison policies and procedures for Quality Assurance and Quality Control.

SECTION 105.6: CONTRACTORS RESPONSIBILITY FOR WORK

The Contractor shall not take advantage of any discrepancy in the plans or specifications. This shall include but not be limited to apparent errors, omissions, and interpretations involving codes, regulations, and standards.

Any Contractor who identifies such a discrepancy during the bidding process shall notify the Project Architect and City Project Manager of the discrepancy prior to the “Questions and Clarifications Deadline” as noted in Section A of the bid documents.

Any Contractor who identifies such a discrepancy during the abatement process shall immediately notify the Project Architect and City Project Manager in writing and request clarification on how to proceed. See Specification 01 26 13-Request for Information (RFI).

If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall perform the work that most closely fits the City’s intent of this contract.

SECTION 105.7: CONTRACT DOCUMENTS

The General Contractor is responsible for reproducing all construction documents necessary to complete the Work at their own cost. This shall include plans, specifications, addenda for the General Contractor and all Sub-contractors.

SECTION 105.9: SURVEYS, POINTS AND INSTRUCTIONS

The General Contractor is responsible for providing all survey, benchmarks, points, and elevations required for this project.

SECTION 105.12: COOPERATION BY THE CONTRACTOR

The General Contractor shall be responsible for the sequencing of the project.

The General Contractor shall coordinate building access, elevator access, and dumpster locations with Monona Terrace.

The Contractor shall review all other specifications within the construction documents for other requirements and coordination of work associated with this contract.

SECTION 107.2: PROTECTION AND RESTORATION OF PROPERTY

The Contractor shall follow these general guidelines while performing work associated with this contract:

- All damage, not consistent with requirements of the contract documents, to either building shall be repaired or replaced to the original or better condition at the Contractor's expense.

SECTION 108.2: PERMITS AND LICENSING

The Contractor shall be required to provide to apply, pay for and obtain all permits or licenses that may be required by these contract documents regardless of ordinance, statute, or other regulatory requirement.

SECTION 109.7: TIME OF COMPLETION

Work shall begin only after the contract is completely executed and the start work letter is received.

The Contractor shall have reached a level of Construction Closeout and Certificate of Occupancy **NO LATER THAN May 27, 2016.**

The Contractor shall have reached a level of Contract Closeout **NO LATER THAN June 24, 2016.**

SECTION 109.7: LIQUIDATED DAMAGES

The fixed, agreed and liquidated damages for failure to complete Construction Closeout by the above specified date shall be **\$1155.00** per calendar day for each calendar day in which the work remains incomplete.

The fixed, agreed and liquidated damages for failure to complete Contract closeout by the above specified date shall be **\$400.00** per calendar day for each calendar day in which the contract remains open.

In no case shall the total fixed, agreed and liquidated damages exceed **\$1155.00** per calendar day.

NON STANDARD BID ITEMS

BID ITEM 90001 – BASE BID

DESCRIPTION: The BASE BID shall include the complete installation of all building, mechanical, site, and utility components; the accepted testing, and commissioning of all systems; and the completion, and turn-in of all deliverables as outlined in the plans and specifications.

METHOD OF MEASUREMENT: The BASE BID shall be measured as Lump Sum of the required construction and installations described in the plans and specifications. Partial Payments shall be requested as indicated in Specifications 01 29 73-Schedule of Values and 01 29 76-Progress Payment Procedures.

BASIS OF PAYMENT: The BASE BID shall be paid at the contract unit price. Partial payments shall be reviewed and authorized as described in the above referenced specifications.

POINTS OF CONTACT

We ask all Contractors with questions and concerns regarding the bidding documents shall contact the Project Architect by e-mail so we may properly log, track, and respond to all issues.

The Project Architect for this contract is:

Tim Usher, AIA
Potter Lawson, Inc.
PH: (608)274-2741
Email: timu@potterlawson.com

The Project Manager for City Engineering, Facility Management for this contract is:

Jim Whitney
City of Madison
PH: (608) 266-4563
Email: jwhitney@cityofmadison.com

Project Manual

Monona Terrace Roof Garden Restrooms Alteration Madison, Wisconsin

City of Madison Project No. 10914

City of Madison Construction Contract No. 7565

August 14, 2015

Potter Lawson No. 2014.41.00



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AUTHORSHIP AND RESPONSIBILITY

For matters of convenience to the bidders, the Project Manual contains documents prepared by multiple Owner separate contracts for A/E services. Project Manual specification sections identified with "PLI" in the page footer have been prepared by Potter Lawson, Inc. and are solely responsible for these sections. Specification sections not identified as such have been prepared by others who are solely responsible for their content.

PROJECT: MONONA TERRACE
ROOF GARDEN
RESTROOMS ALTERATION
MADISON, WISCONSIN 53703

ARCHITECT: POTTER LAWSON, INC.
749 UNIVERSITY ROW, SUITE 300
MADISON, WI 53705
PHONE (608) 274-2741

PROFESSIONAL ENGINEERS:
BY OWNER'S SEPARATE CONTRACT

Mechanical/Electrical KJWW ENGINEERING CONSULTANTS
802 WEST BROADWAY, SUITE 312
MADISON, WISCONSIN 53713
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The following List of Drawings bound separately from the Project Manual comprise the Drawings as referenced in the Bidding Documents and the Contract Documents.

The arrangement, numbering, titling and location of the Drawings within a bound set shall not control the Contractor in dividing the work among Subcontractors or in establishing the extent of Work to be performed by any trade.

DRAWING NO.

DRAWING TITLE

GENERAL

CD01

Cover Drawing

ARCHITECTURAL

A001

Abbreviations, Symbols and Notes

A101

Floor and Demolition Plans

A102

Reflected Ceiling Plans, Elevations, Partition Types and Details

FIRE PROTECTION

F000

Fire Protection Cover Sheet

F101

Partial Floor Plans - Fire Protection

PLUMBING

P000

Cover Sheet - Plumbing

P101

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P102

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P200

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HVAC

M000

Mechanical Cover Sheet

M101

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ELECTRICAL

E000

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EL101

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EP101

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End of List of Drawings

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SPECIFICATIONS

DIVISION 02

1 **SECTION 02 41 23 - SELECTIVE DEMOLITION, ALTERATION, AND PATCHING**
2
3
4

5 **PART ONE - GENERAL**
6

7 DESCRIPTION
8

9 Selective demolition at and within the existing building.
10

11 Restoration of surfaces altered by demolition.
12

13 SUBMITTALS
14

15 Submit permits and notices authorizing demolition if required.
16

17 QUALITY ASSURANCE
18

19 Regulatory Requirements: Comply with governing state or local government agency regulations before beginning
20 demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
21

22 PROJECT CONDITIONS
23

24 Do not interfere with use and operation of existing adjacent facilities. Maintain free and safe passage to and from.
25

26 Prevent movement or settlement of adjacent structures. Provide and place bracing or shoring and be responsible
27 for safety and support of structures. Assume liability for such movement, settlement, damage, or injury.
28

29 Cease operations and notify Owner and A/E immediately if safety of adjacent structures appears to be endangered.
30 Take precautions to properly support structures. Do not resume operations until safety is restored.
31

32 Protect existing work not indicated or scheduled to be altered.
33

34 Prevent movement, settlement or collapse of adjacent services. Assume liability for such movement, settlement or
35 collapse. Promptly repair damage at no cost to the Owner.
36

37 Provide, erect and maintain safety devices as required to protect general public, workers, and adjoining property.
38

39 Coordinate Work on premises with Owner's designated representative.
40

41 Do not close or obstruct roadways without approval of Owner's representative.
42

43 Maintain utilities to existing building at all times.
44
45

46 **PART TWO - PRODUCTS**
47

48 MATERIALS
49

50 Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's
51 property, demolished materials shall become the Contractor's property and shall be removed from the site. Store
52 items as directed by Owner.
53

54 RECYCLING DEMOLITION WASTE
55

56 Owner wishes to encourage contractors and subcontractors to salvage and recycle demolition waste materials as
57 much as possible as a result of this project in order to minimize the impact of construction waste on landfills.

1 SALVAGED MATERIALS
2
3 Salvage sufficient quantities of cut or removed material to replace damaged work of existing construction, when
4 material is not readily obtainable on current market.

5
6 Store salvaged items in a dry, secure place on site.
7 Do not incorporate salvaged or used material in new construction except with permission of Owner.
8

9 PRODUCTS FOR PATCHING

10 Provide as required to match adjacent surfaces or as indicated.
11
12

13
14 **PART THREE - EXECUTION**

15
16 DEMOLITION

17 Demolish in an orderly and careful manner as required to salvage products indicated.

18 Perform demolition in accordance with applicable authorities having jurisdiction.

19 Repair all demolition performed in excess of that required at no cost to the Owner.

20 Burning of materials on site not permitted.
21

22 Remove demolished materials, tools and equipment from site upon completion of work. Leave site in a condition
23 acceptable to Owner.
24

25
26 SALVAGE

27 Carefully remove, salvage, and turn over to Owner items designated on the Drawings to be salvaged.
28

29 Items shall be neatly stockpiled on-site where directed by Owner.
30

31 PATCHING

32 Comply with installation requirements specified elsewhere for products used.
33

34 Patch all damaged surfaces with products to match existing.
35
36
37
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42

43 End of Section

DIVISION 06

SECTION 06 10 00 - ROUGH CARPENTRY

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PART ONE - GENERAL

DESCRIPTION

Types of rough carpentry work include, but not limited to, the following:

Wood grounds, nailers, and blocking.

Preservative treated materials where required.

Wood blocking for support of toilet accessories and other similar items.

Rough hardware items in conjunction with carpentry work such as bolts, washers, hangers, anchors, etc.

Temporary protection.

QUALITY ASSURANCE

Rough carpentry lumber shall be grade stamped by an agency certified by the Board of Review of the American Lumber Standards Committee and manufactured in accordance with Product Standard PS 20-70, as published by the Department of Commerce.

DELIVERY, STORAGE, AND HANDLING

Keep carpentry materials dry during delivery. Store lumber and plywood in stacks with provision for air circulation within stacks. Protect bottom of stacks against contact with damp or wet surfaces, and protect exposed materials against weather.

Do not store dressed or treated lumber or plywood outdoors.

Immediately upon delivery to job site, place materials in area protected from weather.

PROJECT CONDITIONS

Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Coordinate location of nailers, blocking, grounds and similar supports to allow attachment of other work.

PART TWO - PRODUCTS

WOOD PRODUCTS, GENERAL

Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

Factory mark each piece of lumber with grade stamp of grading agency.

For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.

Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness unless otherwise indicated.

1 WOOD-PRESERVATIVE-TREATED MATERIALS

2
3 Preservative Treatment by Pressure Process: Where lumber or plywood is indicated on Drawings as treated, or is
4 specified herein to be treated, comply with applicable requirements of AWPA U1. Use Category UC2 for interior
5 construction.

6
7 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or
8 chromium.

9
10 Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 percent and 15 percent
11 respectively. Do not use material that is warped or that does not comply with requirements for untreated
12 material.

13
14 Mark lumber and plywood with treatment quality mark of an inspection agency approved by the ALSC Board
15 of Review.

16
17 Application: Treat items indicated on Drawings, and the following:

18
19 Wood nailers, blocking, grounds, and similar concealed members in contact with masonry or concrete.

20
21 Plywood in contact with masonry or concrete.

22
23 LUMBER MATERIALS

24
25 Blocking: Standard grade Pine, Fir or equivalent, suitable for pressure treatment.

26
27 SHEET MATERIALS

28
29 Interior Plywood: APA Exterior C-C Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch
30 thick.

31
32 MISCELLANEOUS MATERIALS

33
34 Rough Hardware:

35
36 General: Provide commercial quality and type of rough hardware as required to securely hold all wood members
37 in place in accordance with NFPA National Design Specifications.

38
39 Nails, Spikes, and Staples: Hot dipped galvanized complying with ASTM A 153 for exterior locations, high
40 humidity locations, and treated wood; plain finish for other interior locations; size and type to suit application.

41
42 Bolts, Nuts, Washers, Lags, Pins, and Screws: Corrosion resistant coated fasteners.

43
44 Fasteners: Toggle bolt type for anchorage to hollow masonry, expansion shield and lag bolt type for anchorage to
45 solid masonry and concrete, bolts or power activated type for anchorage to steel.

46
47
48 **PART THREE - EXECUTION**

49
50 INSTALLATION

51
52 General:

53
54 Discard units of material with defects which might impair quality of work, and units which are too small to use in
55 fabricating work with minimum joints or optimum joint arrangement.

56
57 Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

1 Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized
2 standards.

3

4 Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will
5 receive finish materials. Make tight connections between members. Install fasteners without splitting of wood;
6 predrill as required.

7

8 Wood Grounds, Nailers, and Blocking:

9

10 Provide wherever shown and where required for attachment of other work. Form to shapes as shown and cut as
11 required for true line and level of work to be attached. Coordinate location with other work involved.

12

13 Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless
14 otherwise indicated.

15

16 TEMPORARY PROTECTION

17

18 This Section Contractor shall take general charge of furnishing, erecting, keeping in good repair and removal of
19 all necessary temporary guard rails, barricades, and all other necessary temporary protection as required as the
20 work progresses.

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End of Section

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DIVISION 07

SECTION 07 92 00 - JOINT SEALANTS

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PART ONE - GENERAL

DESCRIPTION

Joint sealants, including joint backing, tape, and primer.

Labor, material, tools, equipment, and services necessary for and reasonably incidental to the execution of caulking and sealant work shown on the Drawings or specified herein.

Refer to schedule at end of this Section.

REFERENCES

Sealant and Waterproofers Institute
"Sealants: The Professionals Guide".

QUALITY ASSURANCE

Installer Qualifications: Employ only qualified workers thoroughly skilled and specially trained in the techniques of caulking.

Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

Application Requirements: Mix sealants in strict accordance with the manufacturer's printed directions.

DELIVERY, STORAGE, AND HANDLING

Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multicomponent materials.

Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

Do not use caulking materials that have been stored for a period of time exceeding the maximum recommended shelf life of the materials.

PART TWO - PRODUCTS

MATERIALS, GENERAL

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

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

1 ELASTOMERIC JOINT SEALANTS

2

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

5

6 Dow Corning Corporation

7 GE Advanced Materials

8 Pecora Corporation

9 Sika Corporation, Construction Products Division

10 Tremco Incorporated

11

12 Type 1: Single-Component, Nonsag, Acrylic-Latex Joint Sealant: ASTM C 834, Type OP, Grade NF,
13 formulated to be paintable. Equivalent to Tremco Tremflex 834.

14

15 Type 2: Single-Component, Nonsag, Mildew-Resistant, Acid-Curing Silicone Joint Sealant: ASTM C 920,
16 Type S, Grade NS, Uses NT, G, A, and O. Equivalent to Tremco Tremsil 200.

17

18 JOINT SEALANT BACKING

19

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

23

24 Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonwaxing, nonextruding strips of flexible,
25 nongassing plastic foam of material indicated below; nonabsorbent to water and gas and of size, shape and density
26 to control sealant depth and otherwise contribute to producing optimum sealant performance.

27

28 Provide either open cell polyurethane foam or closed-cell polyethylene foam, subject to approval of sealant
29 manufacturer, for cold-applied sealants only.

30

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

34

35 MISCELLANEOUS MATERIALS

36

37 Primer: Provide type recommended by joint sealant manufacturer where required for adhesion of sealant to joint
38 substrates indicated. Verify whether primer is staining or nonstaining prior to application.

39

40 Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to
41 manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent
42 nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant
43 adhesion or in-service performance.

44

45 Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to
46 joints.

47

48

49 **PART THREE - EXECUTION**

50

51 INSPECTION

52

53 Installer shall inspect joints indicated to receive joint sealants for compliance with requirements for joint
54 configuration, installation tolerances and other conditions affecting joint sealant performance.

55

56 Do not proceed with joint sealant work until unsatisfactory conditions have been corrected.

57

1 PREPARATION

2

3 Surface Cleaning of Joints:

4

5 Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant
6 manufacturers and the following requirements:

7

8 Remove all foreign material from joint substrates which could interfere with adhesion of joint sealant,
9 including dust, paints, except for permanent, protective coatings tested and approved for sealant adhesion
10 and compatibility by sealant manufacturer; oil, grease, water, and surface dirt.

11

12 Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces to
13 produce a clean, sound substrate capable of developing optimum bond with joint sealants.

14

15 Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other nonporous surfaces by
16 chemical cleaners or other means that are not harmful to substrates or leave residues capable of interfering
17 with adhesion of joint sealants.

18

19 Joint Priming: Prime joint substrates where recommended by joint sealant manufacturer. Apply primer to comply
20 with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow
21 spillage or migration onto adjoining surfaces.

22

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

26

27 INSTALLATION

28

29 General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and
30 applications indicated, except where more stringent requirements apply.

31

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

34

35 Joint Sealant Backings: Install joint fillers of type indicated to provide support of sealants during application and
36 at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths
37 which allow optimum sealant movement capability. Do not leave gaps between ends of joint fillers. Do not
38 stretch, twist, puncture or tear joint fillers. Remove absorbent joint fillers that have become wet prior to sealant
39 application and replace with dry material.

40

41 Bond Breaker Tape: Install bond breaker tape between sealants and joint fillers, or back of joints where adhesion
42 of sealant to surfaces at back of joints would result in sealant failure.

43

44 Do not install more joint sealant backing or bond breaker tape than can be caulked in one day.

45

46 Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint
47 substrates, completely filling recesses provided for each joint configuration, and providing uniform,
48 cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

49

50 Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins,
51 tool sealants to form smooth, uniform beads of concave joint configuration, unless otherwise indicated, to
52 eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealant
53 from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not
54 approved by sealant manufacturer.

55

56

57

1 PROTECTION AND CLEANING

2

3 Protect joint sealants during and after curing period from contact with contaminating substances or from damage
4 resulting from construction operations or other causes so that they are without deterioration or damage at time of
5 Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged
6 or deteriorated joint sealants immediately and reseal joints with new materials to produce joint sealant
7 installations with repaired areas indistinguishable from original work.

8

9 Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning
10 materials approved by manufacturers of joint sealants and of products in which joints occur.

11

12 **SCHEDULE**

13

SEALANT

14

INTERIOR

15

16

Perimeters of interior frames:

1

17

18

Joints between dissimilar materials:

1

19

20

Perimeter of toilet room fixtures:

2

21

22

23

24

End of Section

DIVISION 09

SECTION 09 29 00 - GYPSUM BOARD

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PART ONE - GENERAL

DESCRIPTION

Gypsum wallboard, metal stud framing, and accessories.
Acoustical batt insulation in interior partitions.
Acoustical sealants.
Finishing.

RELATED WORK AND REQUIREMENTS

Section 09 90 00: Painting and Coating

REFERENCES

American Standard for Testing and Materials (ASTM)
ASTM C 475 - Specification for Joint Treatment Materials for Gypsum Wallboard Construction.
ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water- Resistant Backing Board.
ASTM C 840 - Specification for Application and Finishing of Gypsum Board.
ASTM C 919 - Practices for Use of Sealants in Acoustical Applications.
ASTM C 1396 - Specification for Gypsum Board.

Gypsum Association (GA)
GA-216 - Application and Finishing of Gypsum Board

SUBMITTALS

Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

QUALITY ASSURANCE

Install materials and components to accommodate tolerances and requirements of Gypsum Wallboard Section 09 29 00, and in accordance with U.S. Gypsum's Current Edition of Gypsum Construction Handbook.

Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

DELIVERY, STORAGE AND HANDLING

Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

Store materials inside under cover and keep them dry and protected against damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1 PROJECT CONDITIONS

2

3 General: Establish and maintain environmental conditions for application and finishing of gypsum board to
4 comply with ASTM C 840 requirements and gypsum board manufacturer's written recommendations, whichever
5 are more stringent.

6

7 Ventilation: Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid
8 drafts during dry, hot weather to prevent materials from drying too rapidly.

9

10

11 **PART TWO - PRODUCTS**

12

13 ACCEPTABLE MANUFACTURERS

14

15 CertainTeed Gypsum, Inc.
16 Georgia-Pacific Corp.
17 Gold Bond Building Products Div., National Gypsum Co.
18 Louisiana-Pacific Corp.
19 United States Gypsum Co. (USG)

20

21 USG products listed to establish standard of quality. Equivalent products by other listed acceptable
22 manufacturers are also acceptable.

23

24 MATERIALS

25

26 Gypsum Wallboard:

27

28 General: Provide gypsum board, ASTM C 1396, of types indicated below in maximum lengths available to
29 minimize end-to-end joints.

30

31 USG Sheetrock SW Gypsum Panels – 5/8-inch thick unless otherwise indicated.

32 USG Sheetrock Mold Tough Regular Core Gypsum Panels – 5/8-inch thick unless otherwise indicated.

33

34 Trim Accessories:

35

36 Outside Corners: USG “Sheetrock” paper faced metal drywall bead.

37 Inside and Outside Angled Corners: “USG Sheetrock” paper faced flexible metal corner tape.

38 Edge Metal: USG “Sheetrock” paper faced metal drywall trim, “J” or “L” shaped.

39 Control Joints: USG #093.

40

41 Joint Treatment Materials:

42

43 General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer
44 of both gypsum board and joint treatment materials for the application indicated.

45

46 Joint Tape: Paper reinforcing tape.

47

48 Joint Compounds: For each coat use formulation that is compatible with other compounds applied on previous or
49 for successive coats.

50

51 Prefilling: At open joints and damage surface areas, use setting-type powder joint compound equivalent
52 to USG “Sheetrock” Lightweight Setting-Type Joint Compound (Easy Sand).

53

54 Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges use
55 ready-mixed joint compound equivalent to USG “Sheetrock” All Purpose Joint Compound.

56

1 Fill and Finish Coats: For second and third coats, use ready-mixed joint compound equivalent to USG
2 “Sheetrock” Lightweight All Purpose Joint Compound (Plus 3).
3
4 Metal Stud Framing: Provide 25 gage galvanized studs with top and bottom runner channels and 1-1/4 inch leg
5 that complies with ASTM C 754 requirements. Size as indicated on Drawings.
6
7 Grid Suspension System: ASTM C 645, direct-hung system composed of main beams and cross-furring members
8 that interlock.
9
10 Basis-of-Design Product: Subject to compliance with requirements, provide Chicago Metallic Corporation;
11 640-C Drywall Grid System or an equivalent product by one of the following:
12
13 Armstrong World Industries, Inc.
14 USG Corporation
15
16 Miscellaneous Materials:
17
18 General: Provide auxiliary materials for gypsum drywall construction that comply with referenced standards and
19 the recommendations of the manufacturer of the gypsum board.
20
21 Laminating Adhesive: Special adhesive or joint compound specifically recommended by the wallboard
22 manufacturer for the application indicated.
23
24 Wallboard Fasteners: Bugle head screws of the type and size recommended by the wallboard manufacturer for
25 the application indicated.
26
27 Metal Stud Fasteners: Suitable for use intended.
28
29 Acoustical Batt Insulation:
30
31 Provide batt/blanket acoustical insulation (without membrane facing) produced by combining thermosetting resins
32 with mineral fibers manufactured from glass, slag wool, or rock wool, complying with ASTM C 665, Type I and
33 ASTM E 136.
34
35 Basis-of-Design Product: Subject to compliance with requirements, provide Johns Manville; Sound
36 Control Batts or an equivalent product by one of the following:
37
38 CertainTeed Corporation
39 Knauf Insulation
40 Owens-Corning
41
42 Acoustical Sealant: Nonsag, paintable, nonstaining, latex sealant for exposed and concealed joints complying
43 with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in
44 building construction as demonstrated by testing representative assemblies according to ASTM E 90.
45
46 Basis-of-Design Product: Subject to compliance with requirements, provide United States Gypsum Co.;
47 Sheetrock Brand Acoustical Sealant or an equivalent product by one of the following:
48
49 Hilti, Inc.
50 Pecora Corporation
51 Specified Technologies, Inc.
52
53 Interior Textured Finish: By Section 09 90 00 contractor.
54
55
56
57

1 **PART THREE - EXECUTION**

2
3 **INSPECTION**

4
5 Inspect substrate to receive gypsum wallboard systems for alignment, support, bracing, etc., prior to installation.
6 Shim, block as required to comply with tolerances.

7
8 Verify that the installation of all blocking, mechanical, and electrical work is completed.

9
10 **INSTALLATION**

11
12 **General:**

13
14 Gypsum Board Application and Finishing Standards: Install and finish gypsum board to comply with ASTM
15 C 840 and GA-216.

16
17 Metal Framing Installation Standard: Install metal framing to comply with ASTM C 754 and ASTM C 840
18 requirements that apply to framing installation.

19
20 **Gypsum Wallboard:**

21
22 Apply gypsum wallboard panels vertically on framing. Extend from floor to structural deck above, unless
23 provided elsewhere in the Contract Documents. Minimize end joints.

24
25 Provide 1/4 to 3/8 inch joint between top of floor system and gypsum wall panels.

26
27 Where double layers of gypsum wallboard are required, offset the second layer from the base layer.

28
29 Cut openings required for air transfer ducts, piping, etc., above ceiling plane or fit panels after installation.

30
31 Except for wall anchors integral with frame, spot-grout loose wall anchors with Durabond.

32
33 Install trim and accessories. Install access panels furnished by other Contractors.

34
35 Install edge trim at all exposed edges of board and where board abuts dissimilar material.

36
37 Apply SW gypsum panels to all stud framing, drops, ceiling, soffits, chases, metal and wood furring, and all other
38 miscellaneous framing, except as provided below:

39
40 Apply Mold Tough gypsum panels on walls and vertical surfaces in toilet rooms.

41
42 Acoustical Batt Insulation: Install where indicated full width and height of assembly.

43
44 Acoustical Sealants: Seal construction at perimeters, behind control and expansion joints, and at openings and
45 penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at
46 perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written
47 recommendations for locating edge trim and closing off sound flanking paths around or through gypsum board
48 assemblies, including sealing partitions above acoustical ceilings.

49
50 **Control Joints:**

51
52 Provide control joints at locations indicated, or if not indicated, at spacings and locations required by referenced
53 gypsum board application and finish standard to prevent cracking of finished drywall. Confer with and obtain
54 A/E's approval prior to installation.

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1 FINISHING

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General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

Prefill open joints and damaged surface areas.

Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

Level 1: Embed tape at joints in ceiling plenum areas and concealed areas unless a higher level of finish is required for sound rated assemblies.

Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile.

Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view.

Finishing work will not be considered acceptable if corners or edges do not form true, level straight, or plumb lines, or if joints, fasteners, head, flanges of trim accessories, or defects are visible after application of field-applied decoration.

Mask junctions with dissimilar materials.

Do not intermix joint compounds.

Allow drying time between application of joint compound in accordance with manufacturer's recommendations for the relative humidity and temperature levels at the time of application.

Lightly sand joint compound smooth between coat applications.

Texture Finish: By Section 09 90 00 contractor.

End of Section

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SECTION 09 30 00 - TILING

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PART ONE - GENERAL

DESCRIPTION

Extent of tile work is indicated on Drawings and in Room Finish Schedule.

Prepare floors and walls for tile installation.

Tile flooring, base, and wall installed using the thinset method with cementitious grouted joints.

REFERENCES

American National Standards Institute (ANSI) – Installation and Material Specifications.

Tile Council of America (TCA) - Handbook for Ceramic Tile Installation (Current Edition).

SUBMITTALS

Product Data: Submit manufacturer's product data and installation instructions for each type of product specified.

Shop Drawings: Submit detailed drawing layouts indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in the substrates and finished tile surfaces.

QUALITY ASSURANCE

Installer Qualifications: Engage an installer with a minimum 5 years experience in work of this Section and who has successfully completed tile installations similar in material, design, and extent to that indicated for this Project.

DELIVERY, STORAGE, AND HANDLING

Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

PROJECT CONDITIONS

Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

PART TWO - PRODUCTS

TILE

Owner furnished, Contractor installed floor and wall tile.

Tile Pattern: Match Owner’s floor tile pattern design following this section.

1 FLOOR SETTING BEDS

2

3 Tile: Polymer modified dry-set mortar system, ANSI A118.4, consisting of "Kerabond" dry-set mortar with
4 "Keralastic" polymer additive as manufactured by Mapei Corporation or equivalent.

5

6 Crack Suppression Membrane: "NobelSeal CIS" .030-inch thick composite elastomeric sheet membrane as
7 manufactured by The Nobel Company.

8

9 BASE AND WALL SETTING BEDS

10

11 On Concrete and Concrete Block Walls: Dry-set or latex portland cement mortar, ANSI A118.1 or A118.4 as
12 recommended by tile manufacturer.

13

14 On Gypsum Wallboard: Organic adhesive ANSI A136.1, A01700 Type I adhesive as recommended by tile
15 manufacturer.

16

17 GROUT

18

19 Floor, Base, and Wall: Colored, commercial, sanded polymer modified portland cement grout, ANSI A118.7;
20 Mapei "Ultracolor Plus" pre-mixed grout, or equivalent. Colors: Owner will select up to three colors from
21 manufacturer's color selection of not less than 20 colors.

22

23 SEALANT

24

25 Multi-component, Pourable Urethane Sealant: ASTM C 920, Type M, Grade P, Class 25, Uses T, M, A, and, as
26 applicable to joint substrates indicated, O. Color to be selected by Owner to match grout color. Provide joint
27 primers, bond breaker tape and backer rods as recommended by sealant manufacturer for the specific application.

28

29 WATER

30

31 Clean, fresh, and free of deleterious substances.

32

33 MISCELLANEOUS MATERIALS

34

35 Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement based formulation
36 provided or approved by manufacturer of tile setting materials for installations indicated.

37

38 Metal Edge Strips: Provide anodized aluminum strips, 1/8-inch wide at top edge with integral provision for
39 anchorage to setting bed or substrate. Height to match tile thickness. Equivalent to CTC Edge as manufactured
40 by Ceramic Tool Company, 1-800-236-5230.

41

42 Threshold Strips: Provide anodized aluminum strips with integral provision for anchorage to setting bed or
43 substrate to provide transition between adjacent floor finish. Bevel edges at 1:2 slope, with lower edge of bevel
44 aligned with adjacent finished floor material or flush with unfinished floor surface. Finish bevel to match top
45 surface of threshold. Limit height of threshold to 1/2-inch or less above adjacent floor surface. Equivalent to
46 CTC Ramp XL or XLK as manufactured by Ceramic Tool Company.

47

48 Expansion Joint Strips: Provide anodized aluminum strips with integral two part polyurethane joint sealant
49 capable of 25 percent movement, height to match tile thickness. Equivalent to CTC Expansion Joint. Color(s) as
50 selected by A/E from manufacturer's full range of colors.

51

52 Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces,
53 specifically approved for materials and installations indicated by tile and grout manufacturers.

54

55 Grout Sealer: Provided or approved by manufacturer of grouting materials for sealing grout joints that does not
56 change color or appearance of grout.

57

1 MIXING MORTARS AND GROUT
2
3 Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written
4 instructions.
5
6 Add materials, water, and additives in accurate proportions.
7
8 Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to
9 produce mortars and grouts of uniform quality with optimum performance characteristics for installations
10 indicated.
11
12
13 **PART THREE - EXECUTION**
14
15 INSPECTION OF FLOORS AND WALLS
16
17 Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with
18 requirements for installation tolerances and other conditions affecting performance of installed tile.
19
20 Verify that substrates for setting tile are firm, dry, clean, free of oil, waxy films, and within flatness tolerances
21 required by referenced ANSI A108 Series of tile installation standards for installations indicated.
22
23 Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar
24 items located in or behind tile have been completed before installing tile.
25
26 Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust
27 joint locations in consultation with Owner.
28
29 Proceed with installation only after unsatisfactory conditions have been corrected.
30
31 PREPARATION
32
33 Remove coatings and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile
34 setting materials.
35
36 Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances
37 specified in referenced ANSI A108 Series of tile installation standards.
38
39 Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile setting
40 material manufacturer's written instructions. Use product specifically recommended by tile setting material
41 manufacturer.
42
43 Remove protrusions, bumps, and ridges by sanding or grinding.
44
45 INSTALLATION
46
47 Layout floors and walls with equal border units, not less than 1/2 tile width.
48
49 Install metal edge strips at locations indicated or where exposed edge of tile flooring meets other hard flooring
50 that finishes flush with top of tile.
51
52 Install metal threshold strips at locations indicated or where exposed edge of tile flooring meets flooring that is
53 below top of tile.
54
55 Comply with ANSI A108 Series or A108.5 and TCA Handbook for tile installation standards that apply to type of
56 setting and grouting materials and methods indicated.
57

1 Tile flooring shall be installed in accordance with TCA Handbook Method F125-Full.
2
3 Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without
4 interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without
5 disrupting pattern or joint alignments.
6
7 Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces.
8 Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to
9 electrical outlets, piping, fixtures, drains, and other penetrations so that plates, collars, or covers overlap tile.
10
11 Ensure square floor drains are adjusted to align with walls and tile joints.
12
13 Ensure tile joints are uniform in width, subject to normal variance in tolerance allowed in tile size. Ensure joints
14 are watertight, without voids, cracks, excess mortar, or grout.
15
16 Sound tile after setting. Remove and replace hollow sounding units.
17
18 Allow tile to set for a minimum of 48 hours prior to grouting.
19
20 EXPANSION, CONTROL, ISOLATION JOINTS
21
22 Locate joints in tile surfaces directly above joints in substrates and in accordance with recommendations of TCA
23 EJ171 to prevent cracking of finished tile floor. Confer with and obtain Architect's approval prior to installation.
24 After grout has cured, prepare joints for sealant by applying primer (if required by sealant manufacturer) to
25 exposed edges of tile. Install bond breaker tape continuously to substrate in joint. Mix and install sealant in joint
26 as recommended by sealant manufacturer.
27
28 Install expansion joint strips at joints.
29
30 Do not saw cut joints after installation of tile flooring.
31
32 GROUTING
33
34 Refer to ANSI specifications for grouting details and follow grout manufacturer's instructions. Grout surface
35 slightly below surface of tile.
36
37 Cure completed installation as recommended by grout manufacturer.
38
39 Grout Sealer: Apply grout sealer to grout joints according to grout sealer manufacturer's written instructions. As
40 soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by
41 wiping with soft cloth.
42
43 CLEANING
44
45 On completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.
46
47 Remove mortar and grout residue from tile as soon as possible.
48
49 Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions. Use only
50 cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by
51 testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from
52 effects of cleaning. Flush surfaces with clean water before and after cleaning.
53
54 When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile wall and
55 floors.
56
57

1 PROTECTION

2

3 Protect installed tile work with kraft paper or other heavy covering during the construction period to prevent
4 staining, damage, and wear.

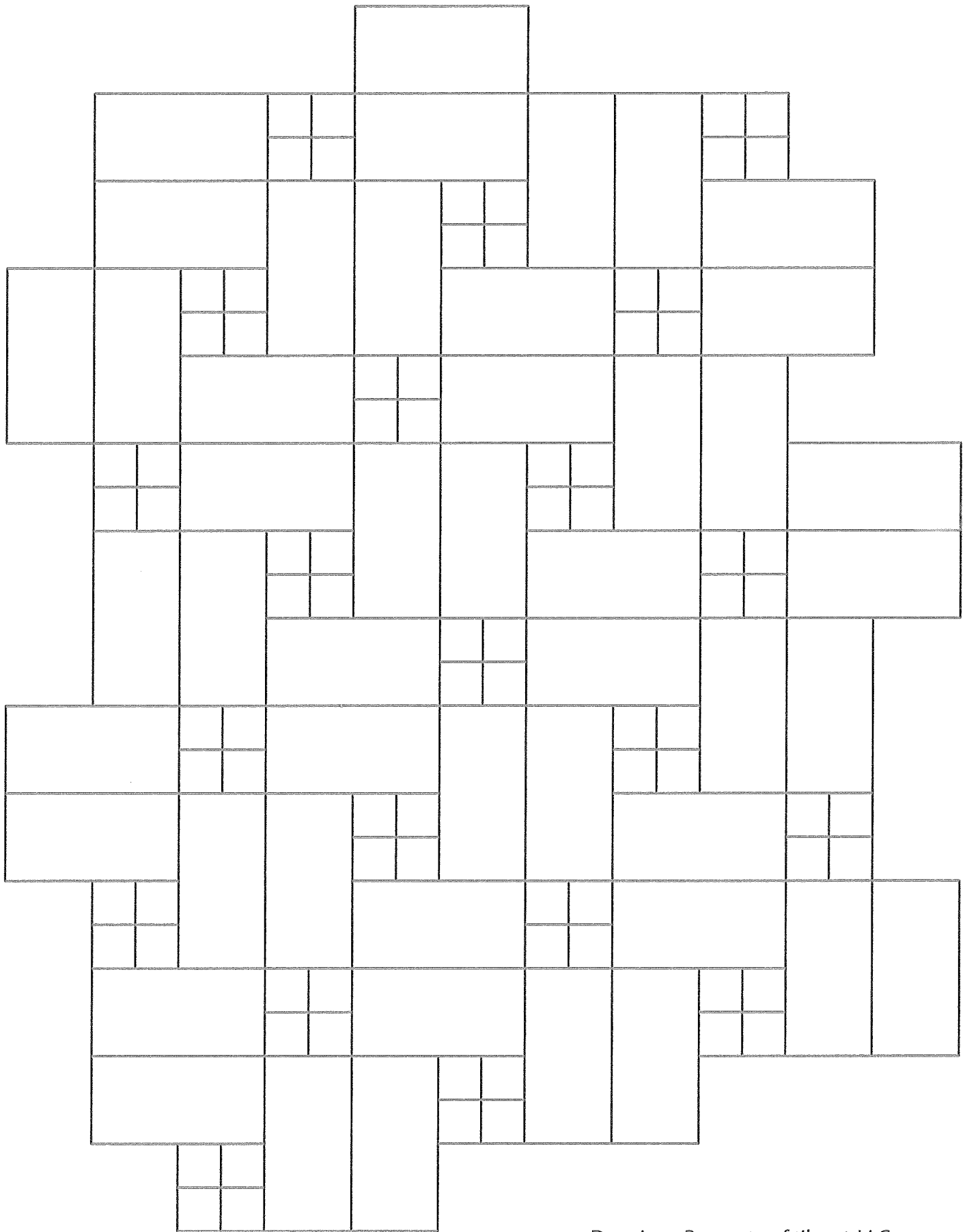
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End of Section



Drawings Property of tileart, LLC

<p>floor - 1</p>	<p>May 30, 2013</p>	<p>This rendering is intended to be used as a visual guide for tile design layout purposes only. Drawing objects are drawn to scale using nominal sizes of tile including a 1/8" to 3/16" grout joint. Lay out all tile materials prior to installation to ensure grout joint and size of materials follow the design. Contact Nan at Tile Art prior to any cutting.</p>	<p>tileart 849 east washington avenue madison, wi 53703 608.255.8453</p>
	<p>MTCCC restroom</p>		
<p>Scale: 1" = 1' - 0"</p>			

SECTION 09 90 00 - PAINTING AND COATING

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PART ONE - GENERAL

DESCRIPTION

Where Drawings and Schedules calls for painted finishes, provide painted systems as specified herein.

Interior painting and finishing.

Surface preparation.

SUBMITTALS

Product Data: Submit manufacturer's technical information and application instructions for each material proposed for use.

Samples: Submit paint and stain samples of each color for Owner's approval. Resubmit until required sheen and color are achieved.

DELIVERY, STORAGE AND HANDLING

Deliver all paints, enamels, and similar materials in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.

Store all materials used on the job in protected areas designated by the Owner. Keep storage place neat and clean, and make good all damage thereto or its surroundings. Remove used rags, waste and trash from the building every night and take every precaution to avoid the danger of fire.

PROJECT CONDITIONS

Before painting is started in any area, broom clean and remove excessive dust.

After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipment.

Provide adequate illumination in all areas where painting operations are in progress.

Schedule and coordinate the work of this Section with other trades and do not proceed until other work and/or job conditions are as required to achieve satisfactory results.

Examine the Contract Documents for various other trades and thoroughly familiarize yourself with all their provisions regarding painting.

EXTRA MATERIALS

Furnish extra paint materials from the same production run as the materials applied in the quantities indicated below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to Owner designated storage room.

Quantity: Not less than 1 gallon of each material and color applied.

1 **PART TWO - PRODUCTS**

2

3 ACCEPTABLE PAINT MANUFACTURER

4

5 Hallman/Lindsay; no substitution.

6

7 MATERIALS

8

9 Provide all painting materials of the best quality and approved by the Owner. They shall bear identifying labels
10 on the containers with the manufacturer's instructions printed thereon. Paint containers not bearing manufacturer's
11 identifying labels or bearing identifying labels of other manufacturers not approved by Owner will not be
12 permitted on the project site.

13

14 Paint shall not be badly settled, caked, or thickened in the container, shall be readily dispersed with a paddle to a
15 smooth consistency and shall have excellent application properties.

16

17 Deliver paint to the job color-mixed except for tinting of undercoats and possible thinning.

18

19 Tinting materials shall be recommended by the manufacturer for the particular material tinted.

20

21 Ensure that all mixed colors match the color selection made by the Owner prior to application of the coating.

22

23 Application Equipment: Application equipment is not required to be new, but shall be adequate for the work and
24 workmanship required herein.

25

26 Accessory Material: Include all required ladders, scaffolding, drop cloths, maskings, scrapers, tools, dusters,
27 cleaning solvents, and waste, as required to perform the Work and achieve the results herein specified.

28

29

30 **PART THREE - EXECUTION**

31

32 INSPECTION

33

34 Before starting any work, carefully examine surfaces to receive paint finishes for defects which cannot be
35 corrected by the procedures specified herein under "PREPARATION OF SURFACES" and which might prevent
36 satisfactory painting results. Do not proceed until such damages are corrected. The commencing of work in a
37 specific area shall be construed as acceptance of the surfaces, and thereafter the painting contractor shall be fully
38 responsible for satisfactory work as required herein.

39

40 PREPARATION OF SURFACES

41

42 General Procedures:

43

44 Remove and protect hardware, accessories, device plates, lighting fixtures, factory finished work and similar
45 items, or provide ample in-place protection. Upon completion of each space, carefully replace all removed items.

46

47 Remove electrical panel box covers and doors before painting walls. Paint separately and reinstall after all paint
48 is dry.

49

50 Surface Preparation:

51

52 Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular
53 substrate condition and as specified.

54

55 Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule
56 cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly
57 painted surfaces.

1 Provide barrier coats over incompatible primers or remove and reprime. Notify Owner in writing of problems
2 anticipated with using the specified finish coat material with substrates primed by others.
3
4 Drywall Surfaces: Fill all minor irregularities with spackling paste and sand to a smooth, level surface. Exercise
5 care to avoid raising nap of paper on drywall.
6
7 APPLICATION - WORKMANSHIP
8
9 Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate
10 and type of material being applied. Employ only skilled mechanics.
11
12 Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a
13 durable paint film.
14
15 Apply materials under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays,
16 brush marks, air bubbles, and excessive roller stipple.
17
18 Apply materials at not less than the manufacturer's recommend spreading rate. Provide a total dry film thickness
19 of the entire system as recommended by the manufacturer.
20
21 Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the
22 surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and
23 coverage, at no additional cost to the Owner.
24
25 Caution: Do not paint base of walls scheduled to receive mastic or adhesive applied base products. Mask or
26 otherwise protect surface.
27
28 All coats shall be dry to manufacturer's recommendations before applying succeeding coats.
29
30 FINISHING OF GYPSUM SURFACES
31
32 Apply texture sealer finish to all exposed surfaces scheduled to be painted only.
33
34 Apply texture sealer finish, matching existing texture finish, to an area of approximately 25 sq. ft. and obtain
35 Owner approval. Approved area shall establish standard for all the Work.
36
37 TOUCH-UP, CLEANING, AND REPAIRS
38
39 Touch-up all marred, scratched or patched surfaces to affect a uniform appearing surface.
40
41 As work progresses, promptly remove paint where spilled, splashed, or spattered.
42
43 Repair to "like new" condition, all surfaces which are damaged due to paint removal, or replace with new work.
44
45 During progress of work, keep premises free from unnecessary accumulation of tools, equipment, rubbish, cans,
46 rags, etc.
47
48 Upon completion of work in any area, leave premises neat and clean and free of rubbish.
49
50 PROTECTION
51
52 Protect work at all times, and protect all adjacent work and materials by suitable covering or other method during
53 progress of Work.
54
55 Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by
56 others for protection of their work after completion of painting operations.
57
58

1 PAINTS AND COATINGS SCHEDULE

2

3 Surfaces to be painted are indicated on the Drawings.

4

5 INTERIOR WORK

6

7 **GWB:**

8

1 coat Smooth Hi-Build Primer, Classic Flat 353

9

2 coats Pro Kote Eco Latex EggShell Enamel 284,

10

Monona Terrace Custom Formula P-2 Eggshell (I-45 L-5Y35 C-5Y10)

11

12 Existing Painted **GWB:**

13

2 coats Pro Kote Eco Latex EggShell Enamel 284

14

Monona Terrace Custom Formula P-2 Eggshell (I-45 L-5Y35 C-5Y10)

15

16 SCHEDULE OF MISCELLANEOUS FINISHES

17

18 **General:**

19

20 Finish mechanical piping and electrical conduits, boxes; sprinkler piping and brackets; ductwork and accessories
21 exposed in rooms and areas scheduled to receive wall and ceiling finishes with 2 spray finish coats of same
22 material and color as adjacent surface, over appropriate primer.

23

24 Examine Drawings and Specifications for miscellaneous items indicated to be finished.

25

26 Include the following:

27

28 Access panels furnished by Plumbing, HVAC and Electrical Contractors.

29

30 Cleanout access covers furnished by Plumbing Contractor.

31

32 Terminal heating units, wall/ceiling registers and grilles furnished by HVAC Contractor.

33

34 Surface raceways "Wiremold" and electrical panel board covers furnished by Electrical Contractor.

35

36 Obtain mechanical and electrical items noted above from respective contractors and spray paint prior to
37 installation.

38

39

40

41

End of Section

DIVISION 10

1 **SECTION 10 21 13 - TOILET COMPARTMENTS**

2
3
4
5 **PART ONE - GENERAL**

6
7 DESCRIPTION

8
9 Metal toilet compartments, ceiling hung.
10 Steel framing and supports for ceiling hung toilet compartments.
11 Urinal screens, wall mounted.

12
13 RELATED WORK AND REQUIREMENTS

14
15 Section 10 28 13: Toilet Accessories

16
17 SUBMITTALS

18
19 Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including
20 catalog cuts of anchors, hardware, fastenings, and accessories.

21
22 Shop Drawings: Submit shop drawings of toilet compartments and screens. Include plans, elevations, and details
23 of overhead steel framing and supports and their connections. Show all anchorage and accessory items and
24 finishes.

25
26 Samples: Submit full range of color samples for each type of unit required. Submit 6-inch square samples of
27 each color and finish on same substrate to be used in work, for color verification after selections have been made.

28
29 QUALITY ASSURANCE

30
31 Requirements of Regulatory Agencies: Comply with American with Disabilities Act, Accessibility Guidelines for
32 Buildings and Facilities (ADA-AG).

33
34 Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where
35 possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever
36 taking of field measurements before fabrication might delay work.

37
38 Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet
39 compartments and screens and related work; coordinate delivery with other work to avoid delay.

40
41
42 **PART TWO - PRODUCTS**

43
44 PAINTED METAL TOILET COMPARTMENTS

45
46 Basis-of-Design Product: Subject to compliance with requirements, provide Global Steel Products Corporation;
47 Imperial Ceiling Hung toilet compartments or an equivalent product by one of the following:

48
49 Accurate Partitions Corporation
50 All American Metal Corp.
51 Bradley Corporation
52 General Partitions Mfg. Corp.
53 Hadrian Manufacturing, Inc.
54 Knickerbocker Partition Corporation
55 Metpar Corp.
56
57

1 Hardware:
2
3 Hinges: Chrome-plated, non-ferrous, cast zinc alloy (zamac), flush with face of door, self-closing type to return
4 door to pre-set and adjustable location.
5
6 Latch and Keeper: Chrome-plated, non-ferrous, cast zinc alloy (zamac), recessed latch unit designed for
7 emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with
8 accessibility requirements at compartments indicated to be handicapped accessible.
9
10 Pilaster Shoe: Stainless steel, one piece.
11
12 Coat Hook: Chrome-plated, non-ferrous, cast zinc alloy (zamac), combination coat hook and rubber-tipped
13 bumper, sized to prevent door from hitting compartment mounted accessories.
14
15 Door Bumper: Chrome-plated, non-ferrous, cast zinc alloy (zamac), rubber-tipped bumpers at out-swinging
16 doors.
17
18 Door Pull: Chrome-plated, non-ferrous, cast zinc alloy (zamac) pull that complies with accessibility requirements
19 at out-swinging doors. Provide pulls on both sides of doors at compartments indicated as handicapped accessible.
20
21 Full-Height (Continuous) Brackets: Stainless steel, standard design for attaching panels and screens to walls and
22 pilasters.
23
24 Overhead Bracing: Manufacturer's standard continuous, extruded aluminum head rail with antigrip profile in
25 manufacturer's standard finish.
26
27 Accessibility Signage: Provide ADA compliant photo-polymer sign indicating accessible stall units. Include
28 double-sided foam tape for attachment. Color: As selected by Owner from not less than ten color combinations.
29
30 Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the
31 items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For
32 concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel
33 compatible with related materials.
34
35 URINAL SCREENS
36
37 Wall mounted, 24 inches wide, wall hung bracket supported type.
38
39 FABRICATION
40
41 Fabricate Work of this Section in accordance with manufacturer's written specifications. Fabricate and reinforce
42 panels to receive accessories specified in Section 10 28 13.
43
44 Ceiling Hung Units: Provide manufacturer's standard corrosion resistant anchoring assemblies with leveling
45 adjustment nuts at pilasters for connection to structural steel framing and supports above finished ceiling. Provide
46 assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves
47 (caps) at tops of pilasters to conceal anchorage.
48
49 FINISHES
50
51 Baked Enamel Color: Color to be selected by Owner from manufacturer's full range.
52
53
54
55
56
57

1 **PART THREE - EXECUTION**

2

3 INSPECTION AND PREPARATION

4

5 Verify correct spacing and size of plumbing fixtures for ADA-AG.

6

7 Inspect conditions to which work will be applied. Report discrepancies to Owner. Obtain site dimensions
8 affecting this Work. Provide appropriate anchorage devices for materials to which work will be attached.

9

10 COORDINATION

11

12 Coordinate Work 10 28 13 contractors.

13

14 INSTALLATION

15

16 Install compartments and screens secure, plumb, level, and square in accordance with manufacturer's
17 recommendations.

18

19 Allow 1/2-inch space between wall and panels and between wall and end pilasters.

20

21 Attach panel brackets securely to walls with appropriate anchor devices.

22

23 Attach panels to brackets with through-sleeve tamperproof bolts and nuts.

24

25 Install coat hook at 48 inches above finished floor.

26

27 Adjust and align hardware to uniform clearance at vertical edges of doors not exceeding 3/16-inch.

28

29 Adjust hinges to locate doors in partial open position when unlatched, except that outswing doors shall return to
30 closed position.

31

32 CLEANING

33

34 Field touch-up of scratches or defaced enamel finish is not acceptable. Replace damaged, scratched, marred or
35 otherwise defective materials.

36

37 Remove protective maskings. Clean surfaces free of oil and imperfections.

38

39 Furnish owner with 4 oz. of each color for touch-up maintenance.

40

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42

43

End of Section

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1 **SECTION 10 28 13 - TOILET ACCESSORIES**

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PART ONE - GENERAL

DESCRIPTION

Toilet room accessories.
Rough-in frames supplied to other sections.
Attachment hardware.

RELATED WORK AND REQUIREMENTS

Section 06 10 00: Rough Carpentry
Section 10 21 13: Toilet Compartments

SUBMITTALS

Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
Samples: If requested by Owner, submit each accessory item to verify design, operation, and finish requirements. Approved full-size samples will be returned and may be used in the Work.
Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
Maintenance Data: Provide lists of replacement parts and service recommendations.

QUALITY ASSURANCE

Source Limitations: Units may be provided by more than one manufacturer, except each type of unit shall be by a single manufacturer throughout the project.
Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated on the Drawings.
Products of other manufacturers listed in Part- Two with equal characteristics, as judged solely by Owner, may be provided.
Do not modify aesthetic effects, as judged solely by Owner, except with Owner’s approval. Where modifications are proposed, submit comprehensive explanatory data to Owner for review.

DELIVERY, STORAGE, AND HANDLING

Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.
Pack accessories individually in a manner to protect accessory and its finish.

WARRANTY

Manufacturer’s Mirror Warranty: Submit written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within 15 years from date of Substantial Completion.

1 **PART TWO - PRODUCTS**

2
3 TOILET ACCESSORIES

4
5 Basis-of-Design Products: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.
6 toilet accessories or equivalent products by one of the following:

7
8 American Specialties, Inc. (ASI)
9 Bradley Corporation

10
11 Owner Furnished Contractor Installed (OFICI) Toilet Accessories: See Drawings.

12
13 MATERIALS

14
15 Stainless Steel: ASTM A 666, Type 304, with No. 4 satin finish.

16
17 Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, surface preparation and metal pretreatment
18 as required for applied finish.

19
20 Galvanized Steel Sheet: ASTM A 653/A 653M, G60.

21
22 Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium
23 electrodeposited on base metal.

24
25 Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q², nominal 1/4-inch thick, with silvering, electroplated
26 copper coating, and protective organic coating complying with FS DD-M-411.

27
28 Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

29
30 Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when
31 exposed, and of galvanized steel when concealed.

32
33 Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum
34 of six keys to Owner's representative.

35
36 FABRICATION

37
38 General: Fabricate units with tight seams and joints and exposed edges rolled and finished smooth without sharp
39 edges. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage
40 and with corrosion-resistant backing plates.

41
42 Framed Glass Mirror Units: Fabricate frames to accommodate glass edge protection material. Provide mirror
43 backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture
44 accumulation.

45
46 Provide galvanized steel backing sheet, not less than 0.034-inch and full mirror size, with nonabsorptive
47 filler material. Corrugated cardboard is not an acceptable filler material.

48
49 Mirror Unit Hangers: Provide mirror unit mounting system that permits rigid, tamper and theft resistant
50 installation.

51
52
53 **PART THREE - EXECUTION**

54
55 PREPARATION

56
57 Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Provide templates and rough-in
58 measurements as required.

1 Owner Purchased (Furnished) Items: Obtain inserts, rough-in frames, templates and rough-in measurements from
2 Owner at appropriate time to incorporate into the Work.
3
4 Before starting work, coordinate accessory locations with other work to prevent interference with clearances
5 required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of
6 accessories. Notify Owner in writing of any conflicts detrimental to installation or operation of units.
7
8 Verify with Owner exact location and mounting heights of accessories.
9
10 INSTALLATION
11
12 Install accessories according to manufacturer's written instructions, using fasteners appropriate to substrate
13 indicated and recommended by unit manufacturer.
14
15 Install units level, plumb, and firmly anchored in locations and at mounting heights indicated. Use security type
16 fasteners.
17
18 Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set
19 units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate
20 indicated.
21
22 Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in
23 ASTM F 446.
24
25 Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this section.
26
27 ADJUSTING AND CLEANING
28
29 Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace
30 damaged or defective items.
31
32 Remove temporary labels and protective coatings.
33
34 Clean and polish exposed surfaces according to manufacturer's written recommendations.
35
36
37
38 End of Section

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DIVISION 21

1

SECTION 21 05 00 - BASIC FIRE SUPPRESSION REQUIREMENTS

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4
5

A. Requirements applicable to all Division 21 Sections. Also refer to Division 1 - General Requirements.

6
7

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced in the specification section.

8

1.2 SCOPE OF WORK

9
10

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

11
12
13

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make his portion of the Mechanical Work a finished and working system.

14
15

C. All work will be awarded under a single General Contract. Please refer to the General Contractor's scope statements for complete scope of work description.

16

1.3 WORK SEQUENCE

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18
19
20

A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.

21
22

1.4 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

23

A. Definitions:

24

1. "Mechanical Contractors" refers to the following:

25
26
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28
29
30

- a. Plumbing Contractor.
- b. Heating Contractor.
- c. Air Conditioning and Ventilating Contractor.
- d. Temperature Control Contractor.
- e. Fire Protection Contractor.
- f. Testing, Adjusting, and Balancing Contractor.

31
32
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36

2. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case the devices are usually single phase and are usually connected to the motor power wiring through a manual motor starter having "Manual-Off-Auto" provisions.

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3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.

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4
4. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. Generally, where the motor power wiring exceeds 120 volts, a control transformer is used to give a control voltage of 120 volts.
- 5
6
7
8
5. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring which directly powers or controls a motor used to drive equipment such as fans, pumps, etc.
- 9
10
11
- a. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt) in which case a control transformer shall be furnished as part of the temperature control wiring.
- 12
13
14
6. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
- 15
- B. General:
- 16
17
18
19
20
21
22
23
1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
- 24
25
26
27
28
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
- 29
30
31
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
- 32
33
34
4. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:
- 35
36
37
38
39
40
41
- a. Light fixtures.
b. Gravity flow piping, including steam and condensate.
c. Electrical busduct.
d. Sheet metal.
e. Electrical cable trays, including access space.
f. Sprinkler piping and other piping.
g. Electrical conduits and wireway.
- 42
- C. Mechanical Contractor's Responsibility:
- 43
44
1. Assumes responsibility for internal wiring of all equipment provided by the Mechanical Contractor.
- 45
46
2. Assumes all responsibility for the Temperature Control wiring, when the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.

- 1 3. This Contractor is responsible for coordination of utilities with all other
2 Contractors. If any field coordination conflicts are found, the Contractor shall
3 coordinate with other Contractors to determine a viable layout.
- 4 D. Electrical Contractor's Responsibility:
- 5 1. Provides all combination starters, manual starters and disconnect devices shown
6 on the Electrical Drawings or indicated to be by the Electrical Contractor on the
7 Mechanical Drawings or Specifications.
- 8 2. Installs and wires all remote control devices furnished by the Mechanical
9 Contractor when so noted on the Electrical Drawings.
- 10 3. Provides motor control and temperature control wiring, where so noted on the
11 drawings.
- 12 4. Coordinate with the Mechanical Contractor for size of motors and/or other
13 electrical devices involved with repair or replacement of existing equipment.
- 14 5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain
15 fans upon actuation of the Fire Alarm System as indicated and specified in
16 Division 28.
- 17 6. This Contractor is responsible for coordination of utilities with all other
18 Contractors. If any field coordination conflicts are found, the Contractor shall
19 coordinate with other Contractors to determine a viable layout.

20 1.5 QUALITY ASSURANCE

- 21 A. Contractor's Responsibility Prior to Submitting Pricing Data:
- 22 1. The Contractor is responsible for constructing complete and operating systems.
23 The Contractor acknowledges and understands that the Contract Documents are a
24 two-dimensional representation of a three-dimensional object, subject to human
25 interpretation. This representation may include imperfect data, interpreted codes,
26 utility guidelines, three-dimensional conflicts, and required field coordination
27 items. Such deficiencies can be corrected when identified prior to ordering
28 material and starting installation. The Contractor agrees to carefully study and
29 compare the individual Contract Documents and report at once in writing to the
30 Design Team any deficiencies the Contractor may discover. The Contractor
31 further agrees to require each subcontractor to likewise study the documents and
32 report at once any deficiencies discovered.
- 33 2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer
34 prior to awarding any subcontracts, ordering material, or starting any work with
35 the Contractor's own employees. Any work performed prior to receipt of
36 instructions from the Design Team will be done at the Contractor's risk.
- 37 B. Qualifications:
- 38 1. Only products of reputable manufacturers are acceptable.
- 39 2. All Contractors and subcontractors shall employ only workers skilled in their
40 trades.
- 41 C. Compliance with Codes, Laws, Ordinances:
- 42 1. Conform to all requirements of the City of Madison, Wisconsin Codes, Laws,
43 Ordinances and other regulations having jurisdiction.

- 1 2. Conform to all State Codes.
- 2 3. If there is a discrepancy between the codes and regulations and these
3 specifications, the Architect/Engineer shall determine the method or equipment
4 used.
- 5 4. If the Contractor notes, at the time of bidding, any parts of the drawings or
6 specifications that do not comply with the codes or regulations, he shall inform the
7 Architect/Engineer in writing, requesting a clarification. If there is insufficient
8 time for this procedure, he shall submit with his proposal a separate price to make
9 the system comply with the codes and regulations.
- 10 5. All changes to the system made after letting of the contract, to comply with codes
11 or requirements of Inspectors, shall be made by the Contractor without cost to the
12 Owner.
- 13 6. If there is a discrepancy between manufacturer's recommendations and these
14 specifications, the manufacturer's recommendations shall govern.
- 15 7. All rotating shafts and/or equipment shall be completely guarded from all contact.
16 Partial guards and/or guards that do not meet all applicable OSHA standards are
17 not acceptable. Contractor is responsible for providing this guarding if it is not
18 provided with the equipment supplied.
- 19 D. Permits, Fees, Taxes, Inspections:
- 20 1. Procure all applicable permits and licenses.
- 21 2. Abide by all laws, regulations, ordinances, and other rules of the State or Political
22 Subdivision where the work is done, or as required by any duly constituted public
23 authority.
- 24 3. Pay all charges for permits or licenses.
- 25 4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory
26 bodies.
- 27 5. Pay all charges arising out of required inspections by an authorized body.
- 28 6. Pay all charges arising out of required contract document reviews associated with
29 the project and as initiated by the Owner or authorized agency/consultant.
- 30 7. Where applicable, all fixtures, equipment and materials shall be approved or listed
31 by Underwriter's Laboratories, Inc.
- 32 E. Examination of Drawings:
- 33 1. The drawings for the fire protection work are completely diagrammatic, intended
34 to convey the scope of the work and to indicate the general arrangements and
35 locations of equipment, outlets, etc., and the approximate sizes of equipment.
- 36 2. Contractor shall determine the exact locations of equipment and rough-ins, and the
37 exact routing of pipes and ducts to best fit the layout of the job.
- 38 3. Scaling of the drawings is not sufficient or accurate for determining these
39 locations.

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4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
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7
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
- 8
9
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
- 10
11
12
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
- 13
14
15
16
8. Where used in fire protection documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.
- 17
18
- a. Any item listed as furnished shall also be installed, unless otherwise noted.
- 19
20
- b. Any item listed as installed shall also be furnished, unless otherwise noted.
- 21 F. Field Measurements:
- 22
23
1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.
- 24 G. Electronic Media/Files:
- 25
26
27
28
1. Construction drawings for this project have been prepared utilizing Revit.
2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
- 29
30
3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by KJWW.
- 31
32
33
4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
- 34
35
36
5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
- 37
38
6. The drawings prepared by KJWW for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
- 39
40
41
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.

1 8. The information is provided to expedite the project and assist the Contractor with
2 no guarantee by KJWW as to the accuracy or correctness of the information
3 provided. KJWW accepts no responsibility or liability for the Contractor's use of
4 these documents.

5 1.6 SUBMITTALS

6 A. Submittals shall be required for the following items, and for additional items where
7 required elsewhere in the specifications or on the drawings.

8 1. Submittals list:

<u>Referenced Specification Section</u>	<u>Submittal Item</u>
21 13 00	Sprinkler Systems

9 B. General Submittal Procedures: In addition to the provisions of Division 1, the following are
10 required:

11 1. Transmittal: Each transmittal shall include the following:

- 12 a. Date
- 13 b. Project title and number
- 14 c. Contractor's name and address
- 15 d. Division of work (e.g., plumbing, heating, ventilating, etc.)
- 16 e. Description of items submitted and relevant specification number
- 17 f. Notations of deviations from the contract documents
- 18 g. Other pertinent data

19 2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

- 20 a. Date
- 21 b. Project title and number
- 22 c. Architect/Engineer
- 23 d. Contractor and subcontractors' names and addresses
- 24 e. Supplier and manufacturer's names and addresses
- 25 f. Division of work (e.g., plumbing, heating, ventilating, etc.)
- 26 g. Description of item submitted (using project nomenclature) and relevant
27 specification number
- 28 h. Notations of deviations from the contract documents
- 29 i. Other pertinent data
- 30 j. Provide space for Contractor's review stamps

31 3. Composition:

- 32 a. Submittals shall be submitted using specification sections and the project
33 nomenclature for each item.
- 34 b. Individual submittal packages shall be prepared for items in each
35 specification section. All items within a single specification section shall
36 be packaged together where possible. An individual submittal may
37 contain items from multiple specifications sections if the items are
38 intimately linked (e.g., pumps and motors).
- 39 c. All sets shall contain an index of the items enclosed with a general topic
40 description on the cover.

41 4. Content: Submittals shall include all fabrication, erection, layout, and setting
42 drawings; manufacturers' standard drawings; schedules; descriptive literature,
43 catalogs and brochures; performance and test data; wiring and control diagrams;

- 1 dimensions; shipping and operating weights; shipping splits; service clearances;
2 and all other drawings and descriptive data of materials of construction as may be
3 required to show that the materials, equipment or systems and the location thereof
4 conform to the requirements of the contract documents.
- 5 5. Contractor's Approval Stamp:
- 6 a. The Contractor shall thoroughly review and approve all shop drawings
7 before submitting them to the Architect/Engineer. The Contractor shall
8 stamp, date and sign each submittal certifying it has been reviewed.
- 9 b. Unstamped submittals will be rejected.
- 10 c. The Contractor's review shall include, but not be limited to, verification
11 of the following:
- 12 1.) Only approved manufacturers are used.
13 2.) Addenda items have been incorporated.
14 3.) Catalog numbers and options match those specified.
15 4.) Performance data matches that specified.
16 5.) Electrical characteristics and loads match those specified.
17 6.) Equipment connection locations, sizes, capacities, etc. have
18 been coordinated with other affected trades.
19 7.) Dimensions and service clearances are suitable for the intended
20 location.
21 8.) Equipment dimensions are coordinated with support steel,
22 housekeeping pads, openings, etc.
23 9.) Constructability issues are resolved (e.g., weights and
24 dimensions are suitable for getting the item into the building and
25 into place, sinks fit into countertops, etc.).
- 26 d. The Contractor shall review, stamp and approve all subcontractors'
27 submittals as described above.
- 28 e. **The Contractor's approval stamp is required on all submittals.**
29 **Approval will indicate the Contractor's review of all material and a**
30 **complete understanding of exactly what is to be furnished.**
31 **Contractor shall clearly mark all deviations from the contract**
32 **documents on all submittals. If deviations are not marked by the**
33 **Contractor, then the item shall be required to meet all drawing and**
34 **specification requirements.**
- 35 6. Submittal Identification and Markings:
- 36 a. The Contractor shall clearly mark each item with the same nomenclature
37 applied on the drawings or in the specifications.
- 38 b. The Contractor shall clearly indicate the size, finish, material, etc.
- 39 c. Where more than one model is shown on a manufacturer's sheet, the
40 Contractor shall clearly indicate exactly which item and which data is
41 intended.
- 42 d. All marks and identifications on the submittals shall be unambiguous.
- 43 7. Schedule submittals to expedite the project. Coordinate submission of related
44 items.
- 45 8. Identify variations from the contract documents and product or system limitations
46 that may be detrimental to the successful performance of the completed work.

- 1 9. Reproduction of contract documents alone is not acceptable for submittals.
- 2 10. Incomplete submittals will be rejected without review. Partial submittals will only
3 be reviewed with prior approval from the Architect/Engineer.
- 4 11. Submittals not required by the contract documents may be returned without
5 review.
- 6 12. The Architect/Engineer's responsibility shall be to review one set of shop drawing
7 submittals for each product. If the first submittal is incomplete or does not
8 comply with the drawings and/or specifications, the Contractor shall be
9 responsible to bear the cost for the Architect/Engineer to recheck and handle the
10 additional shop drawing submittals.
- 11 13. Submittals shall be reviewed and approved by the Architect/Engineer **before**
12 releasing any equipment for manufacture or shipment.
- 13 14. Contractor's responsibility for errors, omissions or deviation from the contract
14 documents in submittals is not relieved by the Architect/Engineer's approval.
- 15 C. Electronic Submittal Procedures:
- 16 1. Distribution: Email submittals as attachments to all parties designated by the
17 Architect/Engineer, unless a web-based submittal program is used.
- 18 2. Transmittals: Each submittal shall include an individual electronic letter of
19 transmittal.
- 20 3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in
21 PDF format, of paper originals are acceptable. Submittals that are not legible will
22 be rejected. Do not set any permission restrictions on files; protected, locked, or
23 secured documents will be rejected.
- 24 4. File Names: Electronic submittal file names shall include the relevant
25 specification section number followed by a description of the item submitted, as
26 follows. Where possible, include the transmittal as the first page of the PDF
27 instead of using multiple electronic files.
- 28 a. Submittal file name: 21 XX XX.description.YYYYMMDD
29 b. Transmittal file name: 21 XX XX.description.YYYYMMDD
- 30 5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files
31 shall be transmitted via a pre-approved method.

32 1.7 CHANGE ORDERS

- 33 A. A detailed material and labor takeoff shall be prepared for each change order, along with
34 labor rates and markup percentages. Change orders with inadequate breakdown will be
35 rejected.
- 36 B. Change order work shall not proceed until authorized.

37 1.8 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

- 38 A. Exercise care in transporting and handling to avoid damage to materials. Store materials
39 on the site to prevent damage. Keep materials clean, dry and free from harmful conditions.
40 Immediately remove any materials that become wet or that are suspected of becoming
41 contaminated with mold or other organisms.

- 1 B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.
- 2 C. Coordinate the installation of heavy and large equipment with the General Contractor
3 and/or Owner. If the Mechanical Contractor does not have prior documented experience in
4 rigging and lifting similar equipment, he/she shall contract with a qualified lifting and
5 rigging service that has similar documented experience. Follow all equipment lifting and
6 support guidelines for handling and moving.
- 7 D. Contractor is responsible for moving equipment into the building and/or site. Contractor
8 shall review site prior to bid for path locations and any required building modifications to
9 allow movement of equipment. Contractor shall coordinate his/her work with other trades.
- 10 1.9 WARRANTY
- 11 A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures,
12 equipment, materials, and workmanship.
- 13 B. The warranty period for all work in this Division of the specifications shall commence on
14 the date of final acceptance, unless a whole or partial system or any separate piece of
15 equipment or component is put into use for the benefit of any party other than the installing
16 contractor with prior written authorization. In this instance, the warranty period shall
17 commence on the date when such whole system, partial system or separate piece of
18 equipment or component is placed in operation and accepted in writing by the Owner.
- 19 C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work
20 found to be defective or nonconforming to the contract documents. The Contractor shall
21 bear the cost of correcting all damage resulting from defects or nonconformance with
22 contract documents.
- 23 1.10 INSURANCE
- 24 A. Contractor shall maintain insurance coverage as set forth in Division 0 of these
25 specifications.
- 26 1.11 MATERIAL SUBSTITUTION
- 27 A. Where several manufacturers' names are given, the manufacturer for which a catalog
28 number is given is the basis for job design and establishes the quality required.
- 29 B. Equivalent equipment manufactured by the other named manufacturers may be used.
30 Contractor shall ensure that all items submitted by these other manufacturers meet all
31 requirements of the drawings and specifications, and fits in the allocated space.
- 32 C. Any material, article or equipment of other unnamed manufacturers which will adequately
33 perform the services and duties imposed by the design and is of a quality equal to or better
34 than the material, article or equipment identified by the drawings and specifications may be
35 used if approval is secured in writing from the Architect/Engineer not later than ten days
36 prior to the bid opening.
- 37 D. This Contractor assumes all costs incurred as a result of using the offered material, article
38 or equipment, on his part or on the part of other Contractors whose work is affected.
- 39 E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid
40 form. These items will not be used in determining the low bidder.
- 41 F. All material substitutions requested later than ten (10) days prior to bid opening must be
42 listed as voluntary changes on the bid form.

1 **PART 2 - PRODUCTS**

2 NOT APPLICABLE

3 **PART 3 - EXECUTION**

4 3.1 JOBSITE SAFETY

5 A. Neither the professional activities of the Architect/Engineer, nor the presence of the
6 Architect/Engineer or his or her employee and subconsultants at a construction site, shall
7 relieve the Contractor and other entity of their obligations, duties and responsibilities
8 including, but not limited to, construction means, methods, sequence, techniques or
9 procedures necessary for performing, superintending or coordinating all portions of the
10 work of construction in accordance with the contract documents and any health or safety
11 precautions required by any regulatory agencies. The Architect/Engineer and his or her
12 personnel have no authority to exercise any control over any construction contractor or
13 other entity or their employees in connection with their work or any health or safety
14 precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer
15 and the Architect/Engineer's consultants shall be indemnified and shall be made additional
16 insureds under the Contractor's general liability insurance policy.

17 3.2 PROJECT CLOSEOUT

18 A. The following paragraphs supplement the requirements of Division 1.

19 B. Final Jobsite Observation:

- 20 1. In order to prevent the Final Jobsite Observation from occurring too early, the
21 Contractor is required to review the completion status of the project and certify
22 that the job is ready for the final jobsite observation.
- 23 2. Attached to the end of this section is a typical list of items that represent the
24 degree of job completeness expected prior to requesting a review.
- 25 3. Upon Contractor certification that the project is complete and ready for a final
26 observation, the Contractor shall sign the attached certification and return it to the
27 Architect/Engineer so that the final observation can be scheduled.
- 28 4. It is understood that if the Architect/Engineer finds the job not ready for the final
29 observation and that additional trips and observations are required to bring the
30 project to completion, the costs incurred by the Architect/Engineer's additional
31 time and expenses will be deducted from the Contractor's contract retainage prior
32 to final payment at the completion of the job.

33 C. Before final payment is authorized, this Contractor must submit the following:

- 34 1. Operation and maintenance manuals with copies of approved shop drawings.
- 35 2. Record documents including marked-up or reproducible drawings and
36 specifications.
- 37 3. A report documenting the instructions given to the Owner's representatives
38 complete with the number of hours spent in the instruction. The report shall bear
39 the signature of an authorized agent of This Contractor and shall be signed by the
40 Owner's representatives.
- 41 4. Inspection report by the State Fire Marshal of the fire protection system.

1 5. Start-up reports on all equipment requiring a factory installation inspection or
2 start-up.

3 3.3 SYSTEM COMMISSIONING

4 A. The fire protection systems shall be complete and operating. System start-up, testing,
5 balancing, and satisfactory system performance is the responsibility of the Contractor. This
6 includes calibration and adjustments of all controls, noise level adjustments and final
7 comfort adjustments as required.

8 B. All operating conditions and control sequences shall be tested during the start-up period.
9 Test all interlocks, safety shutdowns, controls, and alarms.

10 C. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to
11 ensure that all systems perform properly. If the Architect/Engineer is requested to visit the
12 job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment
13 operation, resolving installation and/or workmanship problems, equipment substitution
14 issues or unsatisfactory system performance, including call backs during the warranty
15 period, through no fault of the design; the Contractor shall reimburse the Owner on a time
16 and materials basis for services rendered at the Architect/Engineer's standard hourly rates
17 in effect when the services are requested. The Contractor shall pay the Owner for services
18 required that are product, installation or workmanship related. Payment is due within 30
19 days after services are rendered.

20 3.4 RECORD DOCUMENTS

21 A. The following paragraph supplements Division 1 requirements:

22 Contractor shall maintain at the job site a separate and complete set of fire protection
23 drawings and specifications on which he shall clearly and permanently mark in complete
24 detail all changes made to the fire protection systems.

25 B. Mark drawings to indicate revisions to piping size and location, both exterior and interior;
26 including locations of other control devices, and other units requiring periodic maintenance
27 or repair; actual equipment locations, dimensioned from column lines; actual inverts and
28 locations of underground piping; concealed equipment, dimensioned from column lines;
29 mains and branches of piping systems, with valves and control devices located and
30 numbered, concealed unions located, and with items requiring maintenance located;
31 Change Orders; concealed control system devices.

32 C. Upon completing the job, and before final payment is made, give the marked-up drawings
33 to the Architect/Engineer.

34 3.5 ADJUST AND CLEAN

35 A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the
36 project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material
37 from all equipment.

38 B. Clean all areas where moisture is present. Immediately report any mold, biological growth,
39 or water damage.

40 C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

41 3.6 SPECIAL REQUIREMENTS

42 A. Contractor shall coordinate the installation of all equipment, valves, etc., with other trades
43 to maintain clear access area for servicing.

- 1 B. All equipment shall be installed in such a way to maximize access to parts needing service
2 or maintenance. Review the final field location, placement, and orientation of equipment
3 with the Owner's designated representative prior to setting equipment.
- 4 C. Installation of equipment or devices without regard to coordination of access requirements
5 and confirmation with the Owner's designated representative will result in removal and
6 reinstatement of the equipment at the Contractor's expense.

7 END OF SECTION

1

SECTION 21 05 05 - FIRE SUPPRESSION DEMOLITION FOR REMODELING

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Mechanical demolition.

5

B. Cutting and Patching.

6

PART 2 - PRODUCTS

7

2.1 MATERIALS AND EQUIPMENT

8

A. Materials and equipment shall be as specified in individual Sections.

9

PART 3 - EXECUTION

10

3.1 EXAMINATION

11

A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.

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B. Where walls, ceilings, etc., are shown as being removed on general drawings, the Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts, systems, etc., from the removed area.

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17

18

C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others, This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts, systems, etc.

19

20

21

D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend services to facilities or equipment that shall remain in operation following demolition.

22

23

E. Coordinate work with all other Contractors and the Owner. Schedule removal of equipment to avoid conflicts.

24

25

F. This Contractor shall verify all existing equipment sizes and capacities where equipment is scheduled to be replaced or modified, prior to ordering new equipment.

26

27

G. Bid submittal shall mean the Contractor has visited the project site and verified existing conditions and scope of work.

28

29

3.2 PREPARATION

30

A. Disconnect fire protection systems in walls, floors, and ceilings scheduled for removal.

31

B. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on operating equipment, use personnel experienced in such operations.

32

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3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

35

A. Remove, relocate, and extend existing installations to accommodate new construction.

36

B. Remove abandoned piping to source of supply and/or main lines.

- 1 C. Remove exposed abandoned pipes, including abandoned pipes above accessible ceilings.
2 Cut pipes above ceilings, below floors and behind walls. Cap remaining lines. Repair
3 building construction to match original. Remove all clamps, hangers, supports, etc.
4 associated with pipe and duct removal.
- 5 D. Disconnect and remove mechanical devices and equipment serving equipment that has
6 been removed.
- 7 E. Repair adjacent construction and finishes damaged during demolition and extension work.
- 8 F. Maintain access to existing mechanical installations which remain. Modify installation or
9 provide access panels as appropriate.
- 10 G. Extend existing installations using materials and methods compatible with existing
11 installations, or as specified.

12 3.4 CUTTING AND PATCHING

- 13 A. This Contractor is responsible for all penetrations of existing construction required to
14 complete the work of this project. Refer to Section 21 05 29 for additional requirements.
- 15 B. Penetrations in existing construction should be reviewed carefully prior to proceeding with
16 any work.
- 17 C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where
18 possible for clean opening.
- 19 D. Repair existing construction as required after penetration is complete to restore to original
20 condition. Use similar materials and match adjacent construction unless otherwise noted or
21 agreed to by the Architect/Engineer prior to start of work.
- 22 E. Floor slabs may contain conduit systems. This Contractor is responsible for taking any
23 measures required to ensure no conduits or other services are damaged. This includes x-
24 ray or similar non-destructive means.
- 25 F. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of
26 any cables, conduits, or other services if damaged without proper investigation.

27 3.5 CLEANING AND REPAIR

- 28 A. Clean and repair existing materials and equipment which remain or are to be reused.
- 29 B. Clean all systems adjacent to project which are affected by the dust and debris caused by
30 this construction.
- 31 C. FIRE PROTECTION ITEMS REMOVED AND NOT RELOCATED REMAIN THE
32 PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED
33 BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE
34 CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT
35 TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

36 3.6 SPECIAL REQUIREMENTS

- 37 A. Review locations of all new penetrations in existing floor slabs or walls. Determine
38 construction type and review for possible interferences. Bring all concerns to the attention
39 of the Architect/Engineer before proceeding.

40 END OF SECTION

1

SECTION 21 05 29 - FIRE SUPPRESSION SUPPORTS AND ANCHORS

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Hangers, Supports, and Associated Anchors.
- 5 B. Equipment Bases and Supports.
- 6 C. Sleeves and Seals.
- 7 D. Flashing and Sealing of Equipment and Pipe Stacks.
- 8 E. Cutting of Openings.
- 9 F. Escutcheon Plates and Trim.

10 1.2 QUALITY ASSURANCE

- 11 A. Support Sprinkler Piping in conformance with NFPA 13.
- 12 B. Support Standpipes in conformance with NFPA 14.

13 1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- 14 A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

15 **PART 2 - PRODUCTS**

16 2.1 HANGER RODS

- 17 A. Hanger rods for single rod hangers shall conform to the following:

Pipe Size	Hanger Rod Diameter	
	Column #1	Column #2
2" and smaller	3/8"	3/8"
2-1/2" through 3-1/2"	1/2"	1/2"

18 Column #1: Steel pipe.

- 19 B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8
- 20 inches.

- 21 C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have
- 22 ASTM B633 electro-plated zinc finish.

23 2.2 PIPE HANGERS AND SUPPORTS

- 24 A. All pipe hangers, clamps, and supports shall conform to Manufacturers Standardization
- 25 Society MSS-SP-58 and 127 (where applicable).

- 26 B. Support and laterally brace vertical pipes at every floor level in multi-story structures, and
- 27 more frequently when required by applicable codes, but never at intervals over 15 feet.
- 28 Support vertical pipes with riser clamps installed below hubs, couplings or lugs. Provide
- 29 sufficient flexibility to accommodate expansion and contraction without compromising fire
- 30 barrier penetrations and other fixed takeoff locations.

Acceptable Products:

- Anvil - Fig. CT121
- Cooper/B-Line - Fig. B3373CT
- Erico - Model 510
- Nibco/Tolco - Fig. 82

1 C. Unless otherwise indicated, hangers shall be as follows:

2 1. Clevis Type:
3 Service: Bare Metal Pipe

Acceptable Products:	Bare Steel Pipe
Anvil	Fig. 260
Cooper/B-Line	Fig. 3100
Erico	Model 400
Nibco/Tolco	Fig. 1

5 2. Adjustable Swivel Ring Type:
6 Service: Bare Metal Pipe - 4 inches and Smaller

Acceptable Products:	Bare Steel Pipe
Anvil	Fig. 69
Cooper/B-Line	Fig. B3170NF
Erico	Model FCN
Nibco/Tolco	Fig. 200

7 D. Support may be fabricated from U-Channel strut or similar shapes. Piping less than 4" in
8 diameter shall be secured to strut with clamps of proper design and capacity as required to
9 maintain spacing and alignment. Strut shall be independently supported from hanger drops
10 or building structure. Size and support shall be per manufacturer's installation
11 requirements for structural support of piping. Clamps shall not interrupt piping insulation.

12 1. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633
13 electro-plated zinc finish.

14 2. Strut used in damp areas listed in hanger rods shall have ASTM A123 hot-dip
15 galvanized finish applied after fabrication.

16 E. Unless otherwise indicated, pipe supports for use with struts shall be as follows:

17 1. Clamp Type:
18 Service: Bare Metal Pipe

19 a. Clamps in direct contact with copper pipe shall be plastic coated.

20 b. Pipes subject to expansion and contraction shall have clamps slightly
21 oversized to allow limited pipe movement.

Acceptable Products:	Bare Steel, Plastic or Insulated Pipe
Unistrut	Fig. P1100 or P2500
Cooper/B-Line	Fig. B2000 or B2400
Nibco/Tolco	Fig. A-14 or 2STR

22 F. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as
23 follows:

24 1. Beam Clamps:

Acceptable Products:	
Anvil	Fig. 228, 292
Cooper/B-Line	Fig. B3054
Erico	Model 360
Nibco/Tolco	Fig. 329

- 1 2. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors
2 designed per the requirements of Appendix D of ACI 318-08. Post-installed
3 anchors shall be qualified for use in cracked concrete by ACI-355.2.
- 4 3. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or
5 self-tapping masonry screws. For expansion anchors into hollow concrete block,
6 use sleeve-type anchors designed for the specific application. Do not fasten in
7 masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic
8 inserts.
- 9 G. Wall supports shall be used where vertical height of structure exceeds minimum spacing
10 requirements. Install wall supports at same spacing as hangers or strut supports along
11 vertical length of pipe runs.
- 12 H. Welding:
- 13 1. Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded
14 in lieu of bolting, clamping, or riveting to the building structural frame. Take
15 adequate precautions during all welding operations for fire prevention and for
16 protecting walls and ceilings from being damaged by smoke.

17 2.3 OPENINGS IN FLOORS, WALLS AND CEILINGS

- 18 A. Exact locations of all openings for the installation of materials shall be determined by the
19 Contractor and given to the General Contractor for installation or construction as the
20 structure is built.
- 21 B. Coordinate all openings with other Contractors.
- 22 C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in
23 or through existing structures, or openings in new structures that were not installed, or
24 additional openings. Repair all spalling and damage to the satisfaction of the
25 Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and
26 uniform opening edges.
- 27 D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate
28 openings with other Contractors shall not exempt the Contractor from providing openings
29 at his expense.
- 30 E. Do not cut structural members without written approval of the Architect or Structural
31 Engineer.

32 2.4 PIPE SLEEVES AND LINTELS

- 33 A. Each Contractor shall provide pipe sleeves and lintels for all openings required for the
34 Contractor's work in masonry walls and floors, unless specifically shown as being by
35 others.
- 36 B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings.
37 Provide continuous sleeve. Cut or split sleeves are not acceptable.
- 38 C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the
39 drawings. Have all lintels approved by the Architect or Structural Engineer.
- 40 D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed
41 squared ends extending 1" above the floor in unfinished areas, and flush with the floor in
42 finished areas, to accept spring closing floor plates.

- 1 E. Sleeves shall not penetrate structural members or masonry walls without approval from the
2 Structural Engineer. Sleeves shall then comply with the Engineer's design.
- 3 F. Openings through unexcavated floors and/or foundation walls below the floor shall have a
4 smooth finish with sufficient annular space around material passing through opening so
5 slight settling will not place stress on the material or building structure.
- 6 G. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This
7 Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- 8 H. Where pipes rise through concrete floors that are on earthen grade, provide 3/4" resilient
9 expansion joint material (asphalt and cork) wrapped around the pipe, the full depth of
10 concrete, at the point of penetration. Secure to prevent shifting during concrete placement
11 and finishing.
- 12 I. Size sleeves large enough to allow expansion and contraction movement. Provide
13 continuous insulation wrapping.
- 14 2.5 ESCUTCHEON PLATES AND TRIM
- 15 A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors,
16 or ceilings of finished rooms.
- 17 B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium
18 plated finish, heavy spring clip, rigid hinge and latch.
- 19 C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and
20 raw construction edges of all rectangular openings in finished rooms. This includes duct
21 and pipe openings.
- 22 2.6 PIPE PENETRATIONS
- 23 A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk.
24 Backing material may be used.
- 25 B. Seal fire rated wall and floor penetrations with fire seal system as specified.
- 26 2.7 PIPE ANCHORS
- 27 A. Provide all items needed to allow adequate expansion and contraction of all piping. All
28 piping shall be supported, guided, aligned, and anchored as required.
- 29 B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the
30 building.
- 31 2.8 FINISH
- 32 A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe
33 shafts, and suspended ceiling spaces are not considered exposed.

34 **PART 3 - EXECUTION**

35 3.1 FIRE SUPPRESSION SUPPORTS AND ANCHORS

- 36 A. General Installation Requirements:
- 37 1. Install all items per manufacturer's instructions.

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- 5 B. Supports Requirements:
- 6 1. Install roof pipe supports to resist wind movement per manufacturer's
7 recommendations. Method of securing base to roof shall be compatible with
8 roofing materials.
- 9 2. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel,
10 etc., which attach to it shall be installed prior to application of fireproofing.
11 Repair all fireproofing damaged during pipe installation.
- 12 3. Set all concrete inserts in place before pouring concrete.
- 13 4. Furnish, install and prime all auxiliary structural steel for support of piping
14 systems that are not shown on the Drawings as being by others.
- 15 5. Install hangers and supports complete with lock nuts, clamps, rods, bolts,
16 couplings, swivels, inserts and required accessories.
- 17 6. Hangers for horizontal piping shall have adequate means of vertical adjustment
18 for alignment.
- 19 C. Pipe Requirements:
- 20 1. Support all piping and equipment, including valves, strainers, and other specialties
21 and accessories to avoid objectionable or excessive stress, deflection, swaying,
22 sagging or vibration in the piping or building structure during erection, cleaning,
23 testing and normal operation of the systems.
- 24 2. Do not, however, restrain piping to cause it to snake or buckle between supports
25 or to prevent proper movement due to expansion and contraction.
- 26 3. Support piping at equipment and valves so they can be disconnected and removed
27 without further supporting the piping.
- 28 4. Piping shall not introduce strains or distortion to connected equipment.
- 29 5. Parallel horizontal pipes may be supported on trapeze hangers made of structural
30 shapes and hanger rods; otherwise, pipes shall be supported with individual
31 hangers.
- 32 6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
- 33 7. Provide additional supports where pipe changes direction, adjacent to flanged
34 valves and strainers, at equipment connections and heavy fittings.
- 35 8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with
36 mechanical couplings.
- 37 D. Provided the installation complies with all loading requirements of truss and joist
38 manufacturers, the following practices are acceptable:
- 39 1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom
40 chords of trusses or joists with a minimum 3' spacing between loads.

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2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:
 - a. The hanger is attached within 6" from a web/chord joint.
 - b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.
 3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
 4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.

11 E. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when
12 attaching to metal roof decking (limitation not required with concrete on metal deck). This
13 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging
14 from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel
15 framing will need to be added.

16 F. Do not exceed the manufacturer's recommended maximum load for any hanger or support.

17 G. Spacing of Hangers shall not exceed the compressive strength of the insulation inserts, and
18 in no case shall exceed the following:

<u>Pipe Material</u>	<u>Maximum Spacing</u>
1. Steel (Std. Weight or Heavier – Liquid Service):	
1-1/4" & under	7'-0"
1-1/2"	9'-0"
2"	10'-0"
2-1/2"	11'-0"
3"	12'-0"
4" & larger	12'-0"

19 2. Installation of hangers shall conform to MSS SP-58 and applicable NFPA
20 standards.

21
END OF SECTION

1

SECTION 21 05 53 - FIRE SUPPRESSION IDENTIFICATION

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

4 A. Identification of products installed under Division 21.

5 **PART 2 - PRODUCTS**

6 2.1 ACCEPTABLE MANUFACTURERS

7 A. 3M, Bunting, Calpico, Craftmark, Emedco, Kolbi Industries, Seton, W.H. Brady, Marking
8 Services.

9 2.2 MATERIALS

10 A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths
11 and letter sizes shall be at least the following:

<u>O.D. of Pipe or insulation</u>	<u>Marker Length</u>	<u>Size of Letters</u>
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

12 B. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum
13 letters on light contrasting background.

14 C. Aluminum Nameplates: Black enamel background with natural aluminum border and
15 engraved letters furnished with two mounting holes and screws.

16 D. Plastic Tags: Minimum 1-1/2" square or round laminated three-layer phenolic with
17 engraved, 1/4" minimum black letters on light contrasting background.

18 E. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2"
19 square or 1-1/2" round.

20 F. Stencil Painted Pipe Markers: Use industrial enamel spray paint per ANSI Standard A13.1.
21 Indicate fluid conveyed and flow direction.

22 **PART 3 - EXECUTION**

23 3.1 INSTALLATION

24 A. Install all products per manufacturer's recommendations.

25 B. Degrease and clean surfaces to receive adhesive for identification materials.

26 C. Valves:

27 1. All valves (except shutoff valves at equipment) shall have numbered tags.

28 2. Provide or replace numbered tags on all existing valves that are connected to new
29 systems or that have been revised.

- 1 3. Provide all existing valves used to extend utilities to this project with numbered
 2 tags. Review tag numbering sequence with the Owner prior to ordering tags.
- 3 4. Secure tags with heavy duty key chain and brass "S" link or with mechanically
 4 fastened plastic straps.
- 5 5. Attach to handwheel or around valve stem. On lever operated valves, drill the
 6 lever to attach tags.
- 7 6. Number all tags and show the service of the pipe.
- 8 D. Pipe Markers:
- 9 1. Stencil Painted Pipe Markers:
- 10 a. Remove rust, grease, dirt, and all foreign substances from the pipe
 11 surface.
- 12 b. Apply primer on non-insulated pipes before painting.
- 13 c. Use background and letter colors as scheduled later in this section.
- 14 2. Apply markers and arrows in the following locations where clearly visible:
- 15 a. At each valve.
- 16 b. On both sides of walls that pipes penetrate.
- 17 c. At least every 20 feet along all pipes.
- 18 d. On each riser and each leg of each "T" joint.
- 19 e. At least once in every room and each story traversed.

20 3.2 SCHEDULE

21 A. Pipes to be marked:

Pipe Service	Lettering Color	Background Color
Fire Protection Water	White	Red

22 END OF SECTION

1

SECTION 21 13 00 - FIRE PROTECTION SYSTEMS

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Pipe, Fittings, Valves, and Connections for Fire Protection System.

5

B. Wet-Pipe Sprinkler System.

6

1.2 QUALITY ASSURANCE

7

A. Welding Materials and Procedures: Conform to ASME Code.

8

B. Equipment and Components: Bear UL/FM label or marking.

9

C. Valves: Bear UL/FM label or marking. Provide manufacturer's name and pressure rating marked on valve body. Pressure rating shall match specified pipe system pressure rating. Remanufactured valves are not acceptable.

10

11

12

13

D. Specialist Firm: Company specializing in sprinkler systems with minimum three years' experience.

14

15

16

17

E. Sprinkler design drawings submitted by the contractor shall be designed, certified, and shall include the NICET certification block or the Professional Engineer seal of the fire protection designer. Fire protection designer shall be NICET Level III or Level IV certified or be a licensed Professional Engineer or be a certified Wisconsin Designer.

18

1.3 SUBMITTALS

19

20

21

A. Submit shop drawings per Section 21 05 00. Indicate pipe materials, joining methods, supports, floor and wall penetration seals, sprinklers, equipment data and ratings, and hydraulic calculations.

22

23

B. Submit detailed pipe and sprinkler layout and other calculations and forms as described in NFPA 13.

24

C. Submit detailed working drawings and obtain review of them in the following order:

25

26

27

1. Engineer/Architect.
2. Local Fire Department
3. Owner's Insurance Company

28

Begin construction after all approvals are received.

29

30

31

32

D. Working drawings shall include piping and sprinkler layout, sprinkler types and ratings, sections and elevations at critical points. Show coordination with lighting, ductwork, and diffusers, and indicate basic flow and hydraulic design information, including main location and date that the test was taken.

33

1.4 EXTRA STOCK

34

35

A. Provide metal storage cabinet, wrenches for each sprinkler type, and extra sprinklers per NFPA 13 and applicable building code.

36

1.5 DELIVERY, STORAGE, AND HANDLING

37

A. Store valves and sprinklers in shipping containers, with labels in place.

- 1 B. Provide temporary protective coating on iron and steel valves.
- 2 C. Maintain temporary end caps and closures in place until installation.
- 3 1.6 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS
- 4 A. Furnish sleeves to General Contractor for placement in walls and floors. Sleeve location to
5 be determined by the Fire Protection Contractor prior to construction. If additional sleeves
6 are required, they shall be core drilled by the Fire Protection Contractor.
- 7 1.7 SYSTEM DESCRIPTION
- 8 A. System shall cover building areas noted.
- 9 B. System shall interface with building fire alarm system. Provide all required wiring.
- 10 C. Provide wet pipe sprinkler system to NFPA 13 and building code requirements as required
11 by Owner's insurance company and as shown on the drawings.
- 12 1.8 REGULATORY REQUIREMENTS
- 13 A. All material, equipment, and installation shall be approved by the Authorities Having
14 Jurisdiction and the Owner's Insurance Company.
- 15 B. The Authorities Having Jurisdiction and the Owner's Insurance Company shall have
16 precedence over the drawings and specifications in case of discrepancies.
- 17 C. The entire installation shall comply with all applicable codes.
- 18 1.9 SYSTEM DESIGN
- 19 A. Design and install a complete, hydraulically calculated wet-pipe sprinkler system for the
20 renovated area.
- 21 B. Provide all required equipment and accessories.
- 22 C. System shall include a 5 psi allowance for future decrease in available pressure and an
23 allowance for inside and outside hose streams.
- 24 1.10 OPERATION AND MAINTENANCE DATA
- 25 A. Submit manufacturers' operation and maintenance data. Include written maintenance data
26 on components of system, servicing requirements, and record drawings.
- 27 1.11 JOB CONDITIONS
- 28 A. Fire Protection Contractor shall determine the flow and pressure available at the service
29 connection. The Fire Protection Contractor is responsible to verify this information and
30 make all tests required. Base all pipe sizing and hydraulic calculations on flow test data no
31 older than 18 months.
- 32 B. Pipe sizing shown on drawings for service entrance and main risers is preliminary for
33 coordination purposes only. Contractor is responsible for final sizing from hydraulic
34 calculations.

1 **PART 2 - PRODUCTS**

2 2.1 PIPE AND FITTINGS

3 A. Steel Pipe (Inside Building-Above Grade):

- 4 1. Pipe: 2" and Under - Schedule 40, black steel, ASTM A53. Threaded and coupled
5 or flanged.
- 6 2. Joints: 2" and under - screwed or flanged.
- 7 3. Fittings: Screwed - cast iron, 125 lb., black, ANSI/ASME B16.4 or malleable iron,
8 150 lb., black, ANSI/ASME B16.3. Flanged-cast iron, 125 lb., ANSI/ASME
9 B16.1.

10 B. Steel Pipe (Inside Building-Above Grade):

- 11 1. Pipe: 2-1/2" and Over - Schedule 10, black steel, grooved, ASTM A135.
- 12 2. Joints: Mechanically coupled grooved.
- 13 3. Fittings: 500 lb. WOG, black, malleable iron, ASTM A47.
- 14 4. Plain end fittings and couplings are not acceptable.

15 2.2 FLEXIBLE SPRINKLER HOSE WITH THREADED END FITTINGS

16 A. UL listed per UL 2443 or FM approved.

17 B. Construction:

18 1. Hose:

- 19 a. Type 304 stainless steel.
- 20 b. Straight or elbow hose - maximum six (6)-foot hose length.
- 21 c. 1/2" or 3/4" outlet.
- 22 d. 175 psi rated pressure.
- 23 e. Leak-tested minimum 7/8".
- 24 f. Minimum 7/8" hose.
- 25 g. O-ring sealed joints are not acceptable.

26 2. Ceiling Bracket:

- 27 a. Zinc plated or galvanized steel – 24" and 48" sizes.
- 28 b. Flexible hose attachment: Open hub or set screw.

29 3. Unit may be prepackaged with sprinkler head.

30 C. Acceptable Manufacturers: FlexHead Industries, Victaulic Aquaflex.

31 2.3 UNIONS AND COUPLINGS

32 A. Unions: 175 psi malleable iron for threaded ferrous piping.

33 B. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock,
34 designed to permit some angular and longitudinal deflection; "C" shaped composition
35 sealing gasket, steel bolts, nuts, and washers. 175 psi, ASTM A47. Plain end fittings and
36 couplings are not acceptable. Rolled groove couplings for Schedule 10 pipe. Cut groove
37 couplings for Schedule 40 pipe. Couplings shall be enamel coated for wet systems.
38 Acceptable Manufacturers: Victaulic, ITT, Grinnell, Central, Anvil GruvLok, Star Fittings.

1 C. Coupling gaskets for wet systems shall be Grade "E" EDPM Type A.

2 2.4 EQUIPMENT

3 A. Equipment shall be as scheduled on the drawings.

4 **PART 3 - EXECUTION**

5 3.1 INSTALLATION - PIPING

6 A. General Installation Requirements:

7 1. Coordinate piping and sprinkler locations with all other trades. Ductwork,
8 diffusers and light fixture locations shall have priority over sprinkler piping and
9 sprinklers.

10 2. Ream pipe and tube ends to full inside diameter. Remove burrs. Remove scale and
11 foreign material, inside and outside, before assembly.

12 3. Die cut screw joints with full cut standard taper pipe threads.

13 4. Coat threads with pipe joint compound or wrap with Teflon tape.

14 5. Locate piping to minimize obstruction of other work.

15 6. Route piping in concealed spaces above finished ceiling.

16 7. Use full and double lengths of pipe wherever possible.

17 8. Slope all piping for complete drainage. Install auxiliary drains for all trapped
18 piping per NFPA 13.

19 9. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be
20 the size of the largest pipe shown connecting to it.

21 10. Comply with manufacturer's installation instructions.

22 B. Steel Piping:

23 1. In steel piping, main sized saddle branch connections or direct connection of
24 branches to main is permitted if main is one pipe size larger than the branch for up
25 to 6" mains and if main is two pipe sizes larger than branch for 8" and larger
26 mains. Do not project branch pipes into main pipes.

27 C. Wall/Floor Penetration:

28 1. Provide sleeves when penetrating floors and walls.

29 2. Seal pipes passing through exterior walls with a wall seal per Section 21 05 29.
30 Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.
31 Sleeves through floors shall extend minimum 1.5" above finished floor.

32 3. Fire seal all pipe and sleeve penetrations (both wall and floor) to maintain fire
33 separation required without restraining pipe.

- 1 D. Installation Requirements in Electrical Rooms:
- 2 1. Do not install piping or other equipment above electrical switchboards or
3 panelboards. This includes a dedicated space extending 25 feet from the floor to
4 the structural ceiling with width and depth equal to the equipment. Fire protection
5 equipment dedicated to the electrical equipment room or space may be installed
6 above equipment if other alternatives are not available.
- 7 E. Hangers and Supports:
- 8 1. Provide hangers and supports as required by NFPA 13 and UL/FM, with the
9 following exceptions:
- 10 a. Do not use powder driven devices, explosive devices, wooden plugs, or
11 plastic inserts.
- 12 b. Do not install fasteners to carry the load in tension, unless absolutely
13 necessary.
- 14 F. Exposed Piping:
- 15 1. Install chrome plated steel escutcheons where exposed pipes penetrate walls or
16 floors.
- 17 3.2 INSTALLATION - VALVES
- 18 A. Install gate valves with stems upright or horizontal, not inverted.
- 19 B. Shutoff Valve:
- 20 1. Provide drain valves at main shutoff valves, low points of piping and apparatus.
- 21 3.3 INSTALLATION - EQUIPMENT
- 22 A. Coordinate piping and sprinkler locations with all other trades. Ductwork, diffusers and
23 light fixture locations shall have priority over system equipment and sprinklers.
- 24 B. Sprinklers:
- 25 1. Locate sprinklers to clear lights, ducts and diffusers. Do not run sprinkler pipes
26 through ducts. Ductwork has priority over sprinkler pipes. Offset pipes as needed.
- 27 2. Center sprinklers in two directions in ceiling tiles and provide offsets as required.
- 28 3. Do not allow concealed sprinkler cover plates to be painted. Sprinkler cover
29 plates are to be factory painted only. Do not field paint.
- 30 4. Apply strippable or paper covers so concealed sprinkler cover plates do not
31 receive field paint finish.
- 32 3.4 SYSTEMS CLEANING AND TESTING
- 33 A. General Requirement:
- 34 1. All water used for testing and remaining in the piping system shall be obtained
35 from a potable water source.

DIVISION 22

1

SECTION 22 05 00 - BASIC PLUMBING REQUIREMENTS

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Requirements applicable to all Division 22 Sections. Also refer to Division 1 - General Requirements.

5

6

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced in the specification section.

7

8

1.2 SCOPE OF WORK

9

A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.

10

11

B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make his portion of the Mechanical Work a finished and working system.

12

13

14

C. All work will be awarded under a single General Contract. Please refer to the General Contractors scope statements for complete scope of work description.

15

16

1.3 OWNER FURNISHED PRODUCTS

17

A. The Owner will supply the following items for installation and/or connection by This Contractor:

18

19

1. Plumbing fixtures where noted in plumbing material list.

20

B. The Owner will supply manufacturer's installation data for Owner-purchased equipment for this project.

21

22

C. This Contractor shall make all plumbing system connections shown on the drawings or as required for fully functional units.

23

24

D. This Contractor is responsible for all damage to Owner furnished equipment caused during installation.

25

26

1.4 WORK SEQUENCE

27

A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.

28

29

30

31

1.5 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

32

33

A. Definitions:

34

1. "Mechanical Contractors" refers to the following:

35

a. Plumbing Contractor.

36

b. Heating Contractor.

37

c. Air Conditioning and Ventilating Contractor.

- 1 d. Fire Protection Contractor.
- 2 e. Testing, Adjusting, and Balancing Contractor.

- 3 2. Motor Control Wiring: The wiring associated with the remote operation of the
- 4 magnetic coils of magnetic motor starters or relays, or the wiring that permits
- 5 direct cycling of motors by means of devices in series with the motor power
- 6 wiring. In the latter case the devices are usually single phase and are usually
- 7 connected to the motor power wiring through a manual motor starter having
- 8 "Manual-Off-Auto" provisions.

- 9 3. Control devices such as start-stop push buttons, thermostats, pressure switches,
- 10 flow switches, relays, etc., generally represent the types of equipment associated
- 11 with motor control wiring.

- 12 4. Motor control wiring is single phase and usually 120 volts. In some instances, the
- 13 voltage will be the same as the motor power wiring. Generally, where the motor
- 14 power wiring exceeds 120 volts, a control transformer is used to give a control
- 15 voltage of 120 volts.

- 16 5. Temperature Control Wiring: The wiring associated with the operation of a
- 17 motorized damper, solenoid valve or motorized valve, etc., either modulating or
- 18 two-position, as opposed to wiring which directly powers or controls a motor used
- 19 to drive equipment such as fans, pumps, etc.

- 20 a. This wiring will be from a 120 volt source and may continue as 120 volt,
- 21 or be reduced in voltage (24 volt) in which case a control transformer
- 22 shall be furnished as part of the temperature control wiring.

- 23 6. Control Motor: An electric device used to operate dampers, valves, etc. It may be
- 24 two-position or modulating. Conventional characteristics of such a motor are 24
- 25 volts, 60 cycles, 1 phase, although other voltages may be encountered.

- 26 B. General:

- 27 1. The purpose of these Specifications is to outline the Electrical and Mechanical
- 28 Contractor's responsibilities related to electrical work required for items such as
- 29 temperature controls, mechanical equipment, fans, chillers, compressors and the
- 30 like. The exact wiring requirements for much of the equipment cannot be
- 31 determined until the systems have been selected and submittals reviewed.
- 32 Therefore, the electrical drawings show only known wiring related to such items.
- 33 All wiring not shown on the electrical drawings, but required for mechanical
- 34 systems, is the responsibility of the Mechanical Contractor.

- 35 2. Where the drawings require the Electrical Contractor to wire between equipment
- 36 furnished by the Mechanical Contractor, such wiring shall terminate at terminals
- 37 provided in the equipment. The Mechanical Contractor shall provide complete
- 38 wiring diagrams and supervision to the Electrical Contractor and designate the
- 39 terminal numbers for correct wiring.

- 40 3. All electrical work shall conform to the National Electrical Code. All provisions
- 41 of the Electrical Specifications concerning wiring, protection, etc., apply to wiring
- 42 provided by the Mechanical Contractor unless noted otherwise.

- 43 4. All Contractors shall establish utility elevations prior to fabrication and shall
- 44 coordinate their material and equipment with other trades. When a conflict arises,
- 45 priority is as follows:
 - 46 a. Light fixtures.
 - 47 b. Gravity flow piping, including steam and condensate.

- 1 c. Electrical busduct.
 - 2 d. Sheet metal.
 - 3 e. Electrical cable trays, including access space.
 - 4 f. Sprinkler piping and other piping.
 - 5 g. Electrical conduits and wireway.
- 6 C. Mechanical Contractor's Responsibility:
- 7 1. Assumes responsibility for internal wiring of all equipment provided by the
 - 8 Mechanical Contractor.
 - 9 2. Assumes all responsibility for the Temperature Control wiring, when the
 - 10 Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
 - 11 3. Shall verify all existing equipment sizes and capacities where units are to be
 - 12 modified, moved or replaced. Contractor shall notify Architect/Engineer of any
 - 13 discrepancies prior to ordering new units or replacement parts, including
 - 14 replacements of equipment motors.
 - 15 4. Wiring of all devices needed to make the Temperature Control System functional.
 - 16 5. Verifying any control wiring on the electrical drawings as being by the Electrical
 - 17 Contractor. All wiring required for the Control System, but not shown on the
 - 18 electrical drawings, is the responsibility of the Temperature Control Subcontractor
 - 19 Contractor.
 - 20 6. Coordinating equipment locations (such as relays, transformers, etc.) with the
 - 21 Electrical Contractor, where wiring of the equipment is by the Electrical
 - 22 Contractor.
 - 23 7. This Contractor is responsible for coordination of utilities with all other
 - 24 Contractors. If any field coordination conflicts are found, the Contractor shall
 - 25 coordinate with other Contractors to determine a viable layout.
- 26 D. Electrical Contractor's Responsibility:
- 27 1. Provides all combination starters, manual starters and disconnect devices shown
 - 28 on the Electrical Drawings or indicated to be by the Electrical Contractor on the
 - 29 Mechanical Drawings or Specifications.
 - 30 2. Installs and wires all remote control devices furnished by the Mechanical
 - 31 Contractor when so noted on the Electrical Drawings.
 - 32 3. Provides motor control and temperature control wiring, where so noted on the
 - 33 drawings.
 - 34 4. Coordinate with the Mechanical Contractor for size of motors and/or other
 - 35 electrical devices involved with repair or replacement of existing equipment.
 - 36 5. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain
 - 37 fans upon actuation of the Fire Alarm System as indicated and specified in
 - 38 Division 28.
 - 39 6. This Contractor is responsible for coordination of utilities with all other
 - 40 Contractors. If any field coordination conflicts are found, the Contractor shall
 - 41 coordinate with other Contractors to determine a viable layout.

1 1.6 QUALITY ASSURANCE

2 A. Contractor's Responsibility Prior to Submitting Pricing Data:

3 1. The Contractor is responsible for constructing complete and operating systems.
4 The Contractor acknowledges and understands that the Contract Documents are a
5 two-dimensional representation of a three-dimensional object, subject to human
6 interpretation. This representation may include imperfect data, interpreted codes,
7 utility guidelines, three-dimensional conflicts, and required field coordination
8 items. Such deficiencies can be corrected when identified prior to ordering
9 material and starting installation. The Contractor agrees to carefully study and
10 compare the individual Contract Documents and report at once in writing to the
11 Design Team any deficiencies the Contractor may discover. The Contractor
12 further agrees to require each subcontractor to likewise study the documents and
13 report at once any deficiencies discovered.

14 2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer
15 prior to awarding any subcontracts, ordering material, or starting any work with
16 the Contractor's own employees. Any work performed prior to receipt of
17 instructions from the Design Team will be done at the Contractor's risk.

18 B. Qualifications:

19 1. Only products of reputable manufacturers are acceptable.

20 2. All Contractors and subcontractors shall employ only workers skilled in their
21 trades.

22 C. Compliance with Codes, Laws, Ordinances:

23 1. Conform to all requirements of the City of Madison, Wisconsin Codes, Laws,
24 Ordinances and other regulations having jurisdiction.

25 2. Conform to all State Codes.

26 3. Conform to Federal Act S.3874 requiring the reduction of lead in drinking water.

27 4. If there is a discrepancy between the codes and regulations and these
28 specifications, the Architect/Engineer shall determine the method or equipment
29 used.

30 5. If the Contractor notes, at the time of bidding, any parts of the drawings or
31 specifications that do not comply with the codes or regulations, he shall inform the
32 Architect/Engineer in writing, requesting a clarification. If there is insufficient
33 time for this procedure, he shall submit with his proposal a separate price to make
34 the system comply with the codes and regulations.

35 6. All changes to the system made after letting of the contract, to comply with codes
36 or requirements of Inspectors, shall be made by the Contractor without cost to the
37 Owner.

38 7. If there is a discrepancy between manufacturer's recommendations and these
39 specifications, the manufacturer's recommendations shall govern.

40 8. All rotating shafts and/or equipment shall be completely guarded from all contact.
41 Partial guards and/or guards that do not meet all applicable OSHA standards are
42 not acceptable. Contractor is responsible for providing this guarding if it is not
43 provided with the equipment supplied.

- 1 D. Permits, Fees, Taxes, Inspections:
- 2 1. Procure all applicable permits and licenses.
- 3 2. Abide by all laws, regulations, ordinances, and other rules of the State or Political
4 Subdivision where the work is done, or as required by any duly constituted public
5 authority.
- 6 3. Pay all charges for permits or licenses.
- 7 4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory
8 bodies.
- 9 5. Pay all charges arising out of required inspections by an authorized body.
- 10 6. Pay all charges arising out of required contract document reviews associated with
11 the project and as initiated by the Owner or authorized agency/consultant.
- 12 7. Where applicable, all fixtures, equipment and materials shall be approved or listed
13 by Underwriter's Laboratories, Inc.
- 14 E. Examination of Drawings:
- 15 1. The drawings for the plumbing work are completely diagrammatic, intended to
16 convey the scope of the work and to indicate the general arrangements and
17 locations of equipment, outlets, etc., and the approximate sizes of equipment.
- 18 2. Contractor shall determine the exact locations of equipment and rough-ins, and the
19 exact routing of pipes and ducts to best fit the layout of the job.
- 20 3. Scaling of the drawings is not sufficient or accurate for determining these
21 locations.
- 22 4. Where job conditions require reasonable changes in indicated arrangements and
23 locations, such changes shall be made by the Contractor at no additional cost to
24 the Owner.
- 25 5. Because of the scale of the drawings, certain basic items, such as fittings, boxes,
26 valves, unions, etc., may not be shown, but where required by other sections of the
27 specifications or required for proper installation of the work, such items shall be
28 furnished and installed.
- 29 6. If an item is either on the drawings or in the specifications, it shall be included in
30 this contract.
- 31 7. Determination of quantities of material and equipment required shall be made by
32 the Contractor from the documents. Where discrepancies arise between drawings,
33 schedules and/or specifications, the greater number shall govern.
- 34 8. Where used in mechanical documents, the word "furnish" shall mean supply for
35 use, the word "install" shall mean connect complete and ready for operation, and
36 the word "provide" shall mean to supply for use and connect complete and ready
37 for operation.
- 38 a. Any item listed as furnished shall also be installed, unless otherwise
39 noted.
- 40 b. Any item listed as installed shall also be furnished, unless otherwise
41 noted.

- 1 F. Field Measurements:
- 2 1. Verify all pertinent dimensions at the job site before ordering any materials or
- 3 fabricating any supports, pipes or ducts.
- 4 G. Electronic Media/Files:
- 5 1. Construction drawings for this project have been prepared utilizing Revit.
- 6 2. Contractors and Subcontractors may request electronic media files of the contract
- 7 drawings and/or copies of the specifications. Specifications will be provided in
- 8 PDF format.
- 9 3. Upon request for electronic media, the Contractor shall complete and return a
- 10 signed "Electronic File Transmittal" form provided by KJWW.
- 11 4. If the information requested includes floor plans prepared by others, the
- 12 Contractor will be responsible for obtaining approval from the appropriate Design
- 13 Professional for use of that part of the document.
- 14 5. The electronic contract documents can be used for preparation of shop drawings
- 15 and as-built drawings only. The information may not be used in whole or in part
- 16 for any other project.
- 17 6. The drawings prepared by KJWW for bidding purposes may not be used directly
- 18 for ductwork layout drawings or coordination drawings.
- 19 7. The use of these CAD documents by the Contractor does not relieve them from
- 20 their responsibility for coordination of work with other trades and verification of
- 21 space available for the installation.
- 22 8. The information is provided to expedite the project and assist the Contractor with
- 23 no guarantee by KJWW as to the accuracy or correctness of the information
- 24 provided. KJWW accepts no responsibility or liability for the Contractor's use of
- 25 these documents.

26 1.7 SUBMITTALS

27 A. Submittals shall be required for the following items, and for additional items where

28 required elsewhere in the specifications or on the drawings.

29 1. Submittals List:

<u>Referenced Specification Section</u>	<u>Submittal Item</u>
22 10 00	Plumbing Piping Systems and Valves
Refer to drawings	Plumbing Material List Items

30 B. General Submittal Procedures: In addition to the provisions of Division 1, the following are

31 required:

- 32 1. Transmittal: Each transmittal shall include the following:
- 33 a. Date
- 34 b. Project title and number
- 35 c. Contractor's name and address
- 36 d. Division of work (e.g., plumbing, heating, ventilating, etc.)
- 37 e. Description of items submitted and relevant specification number
- 38 f. Notations of deviations from the contract documents
- 39 g. Other pertinent data

- 1 9) Constructability issues are resolved (e.g., weights and
2 dimensions are suitable for getting the item into the building and
3 into place, sinks fit into countertops, etc.).
- 4 d. The Contractor shall review, stamp and approve all subcontractors'
5 submittals as described above.
- 6 e. **The Contractor's approval stamp is required on all submittals.**
7 **Approval will indicate the Contractor's review of all material and a**
8 **complete understanding of exactly what is to be furnished.**
9 **Contractor shall clearly mark all deviations from the contract**
10 **documents on all submittals. If deviations are not marked by the**
11 **Contractor, then the item shall be required to meet all drawing and**
12 **specification requirements.**
- 13 6. Submittal Identification and Markings:
- 14 a. The Contractor shall clearly mark each item with the same nomenclature
15 applied on the drawings or in the specifications.
- 16 b. The Contractor shall clearly indicate the size, finish, material, etc.
- 17 c. Where more than one model is shown on a manufacturer's sheet, the
18 Contractor shall clearly indicate exactly which item and which data is
19 intended.
- 20 d. All marks and identifications on the submittals shall be unambiguous.
- 21 7. Schedule submittals to expedite the project. Coordinate submission of related
22 items.
- 23 8. Identify variations from the contract documents and product or system limitations
24 that may be detrimental to the successful performance of the completed work.
- 25 9. Reproduction of contract documents alone is not acceptable for submittals.
- 26 10. Incomplete submittals will be rejected without review. Partial submittals will only
27 be reviewed with prior approval from the Architect/Engineer.
- 28 11. Submittals not required by the contract documents may be returned without
29 review.
- 30 12. The Architect/Engineer's responsibility shall be to review one set of shop drawing
31 submittals for each product. If the first submittal is incomplete or does not
32 comply with the drawings and/or specifications, the Contractor shall be
33 responsible to bear the cost for the Architect/Engineer to recheck and handle the
34 additional shop drawing submittals.
- 35 13. Submittals shall be reviewed and approved by the Architect/Engineer **before**
36 releasing any equipment for manufacture or shipment.
- 37 14. Contractor's responsibility for errors, omissions or deviation from the contract
38 documents in submittals is not relieved by the Architect/Engineer's approval.
- 39 C. Electronic Submittal Procedures:
- 40 1. Distribution: Email submittals as attachments to all parties designated by the
41 Architect/Engineer, unless a web-based submittal program is used.

- 1 2. Transmittals: Each submittal shall include an individual electronic letter of
2 transmittal.
- 3 3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in
4 PDF format, of paper originals are acceptable. Submittals that are not legible will
5 be rejected. Do not set any permission restrictions on files; protected, locked, or
6 secured documents will be rejected.
- 7 4. File Names: Electronic submittal file names shall include the relevant
8 specification section number followed by a description of the item submitted, as
9 follows. Where possible, include the transmittal as the first page of the PDF
10 instead of using multiple electronic files.
- 11 a. Submittal file name: 22 XX XX.description.YYYYMMDD
12 b. Transmittal file name: 22 XX XX.description.YYYYMMDD
- 13 5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files
14 shall be transmitted via a pre-approved method.

15 1.8 CHANGE ORDERS

- 16 A. A detailed material and labor takeoff shall be prepared for each change order, along with
17 labor rates and markup percentages. Change orders with inadequate breakdown will be
18 rejected.
- 19 B. Change order work shall not proceed until authorized.

20 1.9 EQUIPMENT SUPPLIERS' INSPECTION

- 21 A. The following equipment shall not be placed in operation until a competent installation and
22 service representative of the manufacturer has inspected the installation and certified that
23 the equipment is properly installed, adjusted and lubricated; that preliminary operating
24 instructions have been given; and that the equipment is ready for operation:
- 25 1. Fire Seal Systems
- 26 B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to
27 assure each phase of equipment installation and/or connection is in accordance with the
28 manufacturer's instructions.
- 29 C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's
30 Operation and Maintenance Manuals.

31 1.10 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

- 32 A. Exercise care in transporting and handling to avoid damage to materials. Store materials
33 on the site to prevent damage. Keep materials clean, dry and free from harmful conditions.
34 Immediately remove any materials that become wet or that are suspected of becoming
35 contaminated with mold or other organisms.
- 36 B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.
- 37 C. Coordinate the installation of heavy and large equipment with the General Contractor
38 and/or Owner. If the Mechanical Contractor does not have prior documented experience in
39 rigging and lifting similar equipment, he/she shall contract with a qualified lifting and
40 rigging service that has similar documented experience. Follow all equipment lifting and
41 support guidelines for handling and moving.

1 D. Contractor is responsible for moving equipment into the building and/or site. Contractor
2 shall review site prior to bid for path locations and any required building modifications to
3 allow movement of equipment. Contractor shall coordinate his/her work with other trades.

4 1.11 WARRANTY

5 A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures,
6 equipment, materials, and workmanship.

7 B. The warranty period for all work in this Division of the specifications shall commence on
8 the date of final acceptance, unless a whole or partial system or any separate piece of
9 equipment or component is put into use for the benefit of any party other than the installing
10 contractor with prior written authorization. In this instance, the warranty period shall
11 commence on the date when such whole system, partial system or separate piece of
12 equipment or component is placed in operation and accepted in writing by the Owner.

13 C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work
14 found to be defective or nonconforming to the contract documents. The Contractor shall
15 bear the cost of correcting all damage resulting from defects or nonconformance with
16 contract documents.

17 1.12 INSURANCE

18 A. Contractor shall maintain insurance coverage as set forth in Division 0 of these
19 specifications.

20 1.13 MATERIAL SUBSTITUTION

21 A. Where several manufacturers' names are given, the manufacturer for which a catalog
22 number is given is the basis for job design and establishes the quality required.

23 B. Equivalent equipment manufactured by the other named manufacturers may be used.
24 Contractor shall ensure that all items submitted by these other manufacturers meet all
25 requirements of the drawings and specifications, and fits in the allocated space.

26 C. Any material, article or equipment of other unnamed manufacturers which will adequately
27 perform the services and duties imposed by the design and is of a quality equal to or better
28 than the material, article or equipment identified by the drawings and specifications may be
29 used if approval is secured in writing from the Architect/Engineer not later than ten days
30 prior to the bid opening.

31 D. This Contractor assumes all costs incurred as a result of using the offered material, article
32 or equipment, on his part or on the part of other Contractors whose work is affected.

33 E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid
34 form. These items will not be used in determining the low bidder.

35 F. All material substitutions requested later than ten (10) days prior to bid opening must be
36 listed as voluntary changes on the bid form.

37 **PART 2 - PRODUCTS**

38 NOT APPLICABLE

1 **PART 3 - EXECUTION**

2 3.1 JOBSITE SAFETY

3 A. Neither the professional activities of the Architect/Engineer, nor the presence of the
4 Architect/Engineer or his or her employee and subconsultants at a construction site, shall
5 relieve the Contractor and other entity of their obligations, duties and responsibilities
6 including, but not limited to, construction means, methods, sequence, techniques or
7 procedures necessary for performing, superintending or coordinating all portions of the
8 work of construction in accordance with the contract documents and any health or safety
9 precautions required by any regulatory agencies. The Architect/Engineer and his or her
10 personnel have no authority to exercise any control over any construction contractor or
11 other entity or their employees in connection with their work or any health or safety
12 precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer
13 and the Architect/Engineer's consultants shall be indemnified and shall be made additional
14 insureds under the Contractor's general liability insurance policy.

15 3.2 PROJECT CLOSEOUT

16 A. The following paragraphs supplement the requirements of Division 1.

17 B. Final Jobsite Observation:

18 1. In order to prevent the Final Jobsite Observation from occurring too early, the
19 Contractor is required to review the completion status of the project and certify
20 that the job is ready for the final jobsite observation.

21 2. Attached to the end of this section is a typical list of items that represent the
22 degree of job completeness expected prior to requesting a review.

23 3. Upon Contractor certification that the project is complete and ready for a final
24 observation, the Contractor shall sign the attached certification and return it to the
25 Architect/Engineer so that the final observation can be scheduled.

26 4. It is understood that if the Architect/Engineer finds the job not ready for the final
27 observation and that additional trips and observations are required to bring the
28 project to completion, the costs incurred by the Architect/Engineer's additional
29 time and expenses will be deducted from the Contractor's contract retainage prior
30 to final payment at the completion of the job.

31 C. Before final payment is authorized, this Contractor must submit the following:

32 1. Operation and maintenance manuals with copies of approved shop drawings.

33 2. Record documents including marked-up or reproducible drawings and
34 specifications.

35 3. A report documenting the instructions given to the Owner's representatives
36 complete with the number of hours spent in the instruction. The report shall bear
37 the signature of an authorized agent of This Contractor and shall be signed by the
38 Owner's representatives.

39 4. Start-up reports on all equipment requiring a factory installation inspection or
40 start-up.

41 5. Provide spare parts, maintenance, and extra materials in quantities specified in
42 individual specification sections. Deliver to project site and place in location as
43 directed; receipt by Architect/Engineer required prior to final payment approval.

1 3.3 SYSTEM COMMISSIONING

- 2 A. The plumbing systems shall be complete and operating. System start-up, testing,
3 balancing, and satisfactory system performance is the responsibility of the Contractor. This
4 includes calibration and adjustments of all controls, noise level adjustments and final
5 adjustments as required.
- 6 B. Contractor shall adjust the plumbing systems and controls at season changes during the one
7 year warranty period, as required, to provide satisfactory operation and to prove
8 performance of all systems in all seasons.
- 9 C. All operating conditions and control sequences shall be tested during the start-up period.
10 Test all interlocks, safety shutdowns, controls, and alarms.
- 11 D. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to
12 ensure that all systems perform properly. If the Architect/Engineer is requested to visit the
13 job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment
14 operation, resolving installation and/or workmanship problems, equipment substitution
15 issues or unsatisfactory system performance, including call backs during the warranty
16 period, through no fault of the design; the Contractor shall reimburse the Owner on a time
17 and materials basis for services rendered at the Architect/Engineer's standard hourly rates
18 in effect when the services are requested. The Contractor shall pay the Owner for services
19 required that are product, installation or workmanship related. Payment is due within 30
20 days after services are rendered.

21 3.4 RECORD DOCUMENTS

- 22 A. The following paragraph supplements Division 1 requirements:
- 23 Contractor shall maintain at the job site a separate and complete set of plumbing drawings
24 and specifications on which he shall clearly and permanently mark in complete detail all
25 changes made to the plumbing systems.
- 26 B. Mark drawings to indicate revisions to piping size and location, both exterior and interior;
27 including locations devices, requiring periodic maintenance or repair; actual equipment
28 locations, dimensioned from column lines; actual inverts and locations of underground
29 piping; concealed equipment, dimensioned from column lines; mains and branches of
30 piping systems, with valves and control devices located and numbered, concealed unions
31 located, and with items requiring maintenance located; Change Orders; concealed control
32 system devices.

33 3.5 PAINTING

- 34 A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and
35 color shall match original equipment paint and shall be obtained from the equipment
36 supplier if available.
- 37 B. Equipment in finished areas that will be painted to match the room decor will be painted by
38 others. Should this Contractor install equipment in a finished area after the area has been
39 painted, he shall have the equipment and all its supports, hangers, etc., painted to match the
40 room decor.
- 41 C. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed
42 spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips,
43 etc.

- 1 D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with
2 baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is
3 specified or is standard to the unit, this Contractor shall, before ordering, verify with the
4 Architect/Engineer his color preference and furnish this color.
- 5 E. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage
6 room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint
7 and enamel need not be painted, provided the factory applied finish is not marred or
8 spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- 9 F. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign
10 matter; paint all pipes and equipment with the following:
- 11 1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being
12 painted. Finish with two coats of Alkyd base enamel paint.
- 13 2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic
14 latex paint.
- 15 3.6 ADJUST AND CLEAN
- 16 A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the
17 project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material
18 from all equipment.
- 19 B. Clean all areas where moisture is present. Immediately report any mold, biological growth,
20 or water damage.
- 21 C. Remove all rubbish, debris, etc., accumulated during construction from the premises.
- 22 3.7 SPECIAL REQUIREMENTS
- 23 A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators,
24 etc., with other trades to maintain clear access area for servicing.
- 25 B. All equipment shall be installed in such a way to maximize access to parts needing service
26 or maintenance. Review the final field location, placement, and orientation of equipment
27 with the Owner's designated representative prior to setting equipment.
- 28 C. Installation of equipment or devices without regard to coordination of access requirements
29 and confirmation with the Owner's designated representative will result in removal and
30 reinstallation of the equipment at the Contractor's expense.
- 31 3.8 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION
- 32 A. Contractors shall make all reasonable efforts to prevent construction activities from
33 affecting the air quality of the occupied areas of the building or outdoor areas near the
34 building. These measures shall include, but not be limited to:
- 35 1. All contractors shall endeavor to minimize the amount of contaminants generated
36 during construction. Methods to be employed shall include, but not be limited to:
- 37 a. Minimizing the amount of dust generated.
38 b. Reducing solvent fumes and VOC emissions.
39 c. Maintain good housekeeping practices, including sweeping and periodic
40 dust and debris removal. There should be no visible haze in the air.
41 d. Protect stored on-site and installed absorptive materials from moisture
42 damage.

- 1 2. Request that the Owner designate an IAQ representative.
- 2 3. Review and receive approval from the Owner's IAQ representative for all IAQ-
- 3 related construction activities and negative pressure containment plans.
- 4 4. Inform the IAQ representative of all conditions that could adversely impact IAQ,
- 5 including operations that will produce higher than normal dust production or
- 6 odors.
- 7 5. Schedule activities that may cause IAQ conditions that are not acceptable to the
- 8 Owner's IAQ representative during unoccupied periods.
- 9 6. Request copies of and follow all of the Owner's IAQ and infection control
- 10 policies.
- 11 7. Unless no other access is possible, the entrance to construction site shall not be
- 12 through the existing facility.
- 13 8. To minimize growth of infectious organisms, do not permit damp areas in or near
- 14 the construction area to remain for over 24 hours.
- 15 9. In addition to the criteria above, provide measures as recommended in the
- 16 SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

17

END OF SECTION

1

SECTION 22 05 03 - THROUGH PENETRATION FIRESTOPPING

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Through-Penetration Firestopping.

5

1.2 QUALITY ASSURANCE

6

A. Manufacturer: Company specializing in manufacturing products specified in this Section.

7

B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

8

9

1.3 DELIVERY, STORAGE, AND HANDLING

10

A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer’s instructions for storage.

11

12

13

14

B. Install material prior to expiration of product shelf life.

15

1.4 PERFORMANCE REQUIREMENTS

16

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

17

18

19

20

21

1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.

22

23

24

2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.

25

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:

26

27

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

28

29

30

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings:

31

32

a. Floor penetrations located outside wall cavities.

33

b. Floor penetrations located outside fire-resistance-rated shaft enclosures.

34

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

35

36

37

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

38

39

1 E. For through-penetration firestop systems in air plenums, provide products with flame-
2 spread and smoke-developed indexes of less than 25 and 50, respectively, as determined
3 per ASTM E 84.

4 1.5 WARRANTY

5 A. Provide one year warranty on parts and labor.

6 B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion,
7 cohesion, abrasion resistance, weather resistance, extrusion resistance, migration
8 resistance, stain resistance, general durability, or appear to deteriorate in any manner not
9 clearly specified by the manufacturer as an inherent quality of the material.

10 **PART 2 - PRODUCTS**

11 2.1 MANUFACTURERS

12 A. Products: Subject to compliance with requirements, provide one of the through-penetration
13 firestop systems indicated for each application that are produced by one of the following
14 manufacturers. All firestopping systems installed shall be provided by a single
15 manufacturer.

- 16 1. 3M; Fire Protection Products Division.
- 17 2. Hilti, Inc.
- 18 3. RectorSeal Corporation, Metacaulk.
- 19 4. Tremco; Sealant/Weatherproofing Division.
- 20 5. Johns-Manville.
- 21 6. Specified Technologies Inc. (S.T.I.)
- 22 7. Spec Seal Firestop Products
- 23 8. AD Firebarrier Protection Systems

24 2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

25 A. Provide materials and systems classified by or listed by Warnock Hersey to provide
26 firestopping equal to time rating of construction being penetrated.

27 B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that
28 would require hazardous waste removal.

29 C. Firestopping shall be flexible to allow for normal penetrating item movement due to
30 expansion and contraction.

31 D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture
32 resistant.

33 E. Provide firestopping systems capable of supporting floor loads where systems are exposed
34 to possible floor loading or traffic.

35 F. Provide firestopping systems allowing continuous insulation for all insulated pipes.

36 G. Provide firestopping systems classified by UL or listed by Warnock Hersey for
37 penetrations through all fire rated construction. Firestopping systems shall be selected
38 from the UL or listed by Warnock Hersey Fire Resistance Directory Category XHEZ based
39 on substrate construction and penetrating item size and material and shall fall within the
40 range of numbers listed:

- 1 1. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated
 2 F Rating = Wall/Floor Rating
 3 T Rating (Floors) = Floor Rating

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Insulated Pipes	CAJ 5000-5999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

4 *Alternate method of firestopping is patching opening to match original rated
 5 construction.

6 H. Any opening in walls or floors not covered by the listed series of numbers shall be
 7 coordinated with the firestopping manufacturer.

8 I. Any openings in floors or walls not described in the UL or listed by Warnock Hersey Fire
 9 Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner
 10 agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having
 11 Jurisdiction.

12 **PART 3 - EXECUTION**

13 3.1 EXAMINATION

14 A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose
 15 materials. Clean and repair surfaces as required. Remove laitance and form-release agents
 16 from concrete.

17 B. Ensure substrate and penetrating items have been permanently installed prior to installing
 18 firestopping systems. Ensure penetrating items have been properly spaced and have proper
 19 clearance prior to installing firestopping systems.

20 C. Surfaces to which sealing materials are to be installed must meet the selected UL or
 21 Warnock Hersey system substrate criteria.

22 D. Prime substrates where recommended in writing by through-penetration firestop system
 23 manufacturer. Confine primer to area of bond.

24 3.2 INSTALLATION

25 A. In existing construction, provide firestopping of openings prior to and after installation of
 26 penetrating items. Remove any existing coatings on surfaces prior to firestopping
 27 installation. Temporary firestopping shall consist of packing openings with fire resistant
 28 mineral wool for the full thickness of substrate, or an alternate method approved by the
 29 Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately
 30 upon their installation and shall remain so until the permanent UL or listed by Warnock
 31 Hersey listed firestopping system is installed.

32 B. Install penetration seal materials in accordance with printed instructions of the UL or
 33 Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application
 34 instructions.

1 C. Install dams as required to properly contain firestopping materials within openings and as
2 required to achieve required fire resistance rating. Remove combustible damming after
3 appropriate curing.

4 3.3 CLEANING AND PROTECTING

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

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

13 3.4 INSPECTION

14 A. All penetrations shall be inspected by the manufacturer's representative to ensure proper
15 installation.

16 B. Access to firestop systems shall be maintained for examination by the Authority Having
17 Jurisdiction at their request.

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

20 D. The contractor shall allow for visual destructive review of 5% of installed firestop systems
21 (minimum of one) to prove compliance with specifications and manufacturer's instructions
22 and details. Destructive system removal shall be performed by the contractor and
23 witnessed by the engineer and manufacturer's factory representative. The engineer shall
24 have sole discretion of which firestop system installations will be reviewed. The contractor
25 is responsible for all costs associated with this requirement including labor and material for
26 removing and replacing the installed firestop system. If any firestop system is found to not
27 be installed per manufacturer's specific instructions and details, all firestop systems are
28 subject to destructive review and replacement at the engineer's discretion and the
29 contractor's expense.

30 END OF SECTION

1

SECTION 22 05 05 - PLUMBING DEMOLITION FOR REMODELING

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Mechanical demolition.

5

B. Cutting and Patching.

6

PART 2 - PRODUCTS

7

2.1 MATERIALS AND EQUIPMENT

8

A. Materials and equipment shall be as specified in individual Sections.

9

PART 3 - EXECUTION

10

3.1 EXAMINATION

11

A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.

12

13

14

15

B. Where walls, ceilings, etc., are shown as being removed on general drawings, the Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts, systems, etc., from the removed area.

16

17

18

C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others, This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts, systems, etc.

19

20

21

D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend services to facilities or equipment that shall remain in operation following demolition.

22

23

E. Coordinate work with all other Contractors and the Owner. Schedule removal of equipment to avoid conflicts.

24

25

F. This Contractor shall verify all existing equipment sizes and capacities where equipment is scheduled to be replaced or modified, prior to ordering new equipment.

26

27

G. Bid submittal shall mean the Contractor has visited the project site and verified existing conditions and scope of work.

28

29

3.2 PREPARATION

30

A. Disconnect plumbing systems in walls, floors, and ceilings scheduled for removal.

31

B. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on operating equipment, use personnel experienced in such operations.

32

33

34

C. Existing Plumbing System: Maintain service to all plumbing fixtures until new piping is installed. Obtain permission from Owner at least 48 hours before shutting down system for any reason. Make changeover to new piping with minimum outage. Do not disconnect any roof drainage piping until new piping is in place and operational.

35

36

37

1 3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

- 2 A. Demolish and extend existing plumbing work under provisions of Division 2 and this
3 Section.
- 4 B. Remove, relocate, and extend existing installations to accommodate new construction.
- 5 C. Remove abandoned piping to source of supply and/or main lines.
- 6 D. Remove exposed abandoned pipes, including abandoned pipes above accessible ceilings.
7 Cut pipes above ceilings, below floors and behind walls. Cap remaining lines. Repair
8 building construction to match original. Remove all clamps, hangers, supports, etc.
9 associated with pipe and duct removal.
- 10 E. Disconnect and remove mechanical devices and equipment serving equipment that has
11 been removed.
- 12 F. Repair adjacent construction and finishes damaged during demolition and extension work.
- 13 G. Extend existing installations using materials and methods compatible with existing
14 installations, or as specified.
- 15 H. Remove unused sections of domestic water piping back to mains and cap. Capped pipe
16 shall be less than 2 feet from main to prevent "dead legs".
- 17 I. Temporarily cap all openings to the sanitary and vent system to prevent odor from entering
18 the work area and building.

19 3.4 CUTTING AND PATCHING

- 20 A. This Contractor is responsible for all penetrations of existing construction required to
21 complete the work of this project. Refer to Section 22 05 29 for additional requirements.
- 22 B. Penetrations in existing construction should be reviewed carefully prior to proceeding with
23 any work.
- 24 C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where
25 possible for clean opening.
- 26 D. Repair existing construction as required after penetration is complete to restore to original
27 condition. Use similar materials and match adjacent construction unless otherwise noted or
28 agreed to by the Architect/Engineer prior to start of work.
- 29 E. Floor slabs may contain conduit systems. This Contractor is responsible for taking any
30 measures required to ensure no conduits or other services are damaged. This includes x-
31 ray or similar non-destructive means.
- 32 F. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of
33 any cables, conduits, or other services if damaged without proper investigation.

34 3.5 CLEANING AND REPAIR

- 35 A. Clean and repair existing materials and equipment which remain or are to be reused.
- 36 B. Clean all systems adjacent to project which are affected by the dust and debris caused by
37 this construction.

1 C. PLUMBING ITEMS REMOVED AND NOT RELOCATED REMAIN THE PROPERTY
2 OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE
3 OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE
4 CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT
5 TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

6 3.6 SPECIAL REQUIREMENTS

7 A. Review locations of all new penetrations in existing floor slabs or walls. Determine
8 construction type and review for possible interferences. Bring all concerns to the attention
9 of the Architect/Engineer before proceeding.

10 END OF SECTION

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SECTION 22 05 29 - PLUMBING SUPPORTS AND ANCHORS

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Hangers, Supports, and Associated Anchors.
- 5 B. Equipment Bases and Supports.
- 6 C. Sleeves and Seals.
- 7 D. Flashing and Sealing of Equipment and Pipe Stacks.
- 8 E. Cutting of Openings.
- 9 F. Escutcheon Plates and Trim.

10 1.2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- 11 A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

12 **PART 2 - PRODUCTS**

13 2.1 HANGER RODS

- 14 A. Hanger rods for single rod hangers shall conform to the following:

Pipe Size	Hanger Rod Diameter	
	Column #1	Column #2
2" and smaller	3/8"	3/8"
2-1/2" through 3-1/2"	1/2"	1/2"
4" and 5"	5/8"	1/2"
6"	3/4"	5/8"

- 15 Column #1: Cast iron pipe.
- 16 Column #2: Copper pipe.

- 17 B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8
- 18 inches.
- 19 C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have
- 20 ASTM B633 electro-plated zinc finish.

21 2.2 PIPE HANGERS AND SUPPORTS

- 22 A. All pipe hangers, clamps, and supports shall conform to Manufacturers Standardization
- 23 Society MSS-SP-58 and 127 (where applicable).
- 24 B. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and
- 25 jacket to pass through unbroken. This applies to both hot and cold pipes.
- 26 C. Ferrous hot piping 2-1/2 inches and larger shall have steel saddles tack welded to the pipe
- 27 at each support at a depth not less than the specified insulation. Factory fabricated inserts
- 28 may be used.

Acceptable Products:

- Anvil - Fig. 160, 161, 162, 163, 164, 165
- Cooper/B-Line - Fig. 3160, 3161, 3162, 3163, 3164, 3165
- Erico - Model 630, 631, 632, 633, 634, 635
- Nibco/Tolco - Fig. 260-1, 261-1 1/2, 262-2, 263-2 1/2, 264-3, 265-4

1 D. On all insulated piping, provide a semi-cylindrical metallic shield and fire resistant vapor
2 barrier jacket.

3 E. As an alternative to separate pipe insulation insert and saddle, properly sized integral rigid
4 insulation sections may be used for this application.

Acceptable Products:

Cooper/B-Line - Fig. B3380 through B3384

Pipe Shields - A1000, A2000

Erico - Model 124, 127

5 F. Support and laterally brace vertical pipes at every floor level in multi-story structures, and
6 more frequently when required by applicable codes (the Illinois Plumbing Code requires 10
7 foot maximum spacing for support of copper risers), but never at intervals over 15 feet.
8 Support vertical pipes with riser clamps installed below hubs, couplings or lugs welded to
9 the pipe. Provide sufficient flexibility to accommodate expansion and contraction without
10 compromising fire barrier penetrations and other fixed takeoff locations.

Acceptable Products:

Anvil - Fig. CT121

Cooper/B-Line - Fig. B3373CT

Erico - Model 510

Nibco/Tolco - Fig. 82

11 G. Place restrained neoprene mounts beneath vertical pipe riser clamps to prevent sweating of
12 cold pipes. Insulate over mounts.

13 Acceptable Products: Mason RBA, RCA, or BR.

14 H. Hangers in direct contact with copper pipe shall be coated with plastic with appropriate
15 temperature range. HYDRA-ZORB clamps are permitted for this application for bare
16 pipes within their temperature limits of -65°F to +275°F.

17 I. Unless otherwise indicated, hangers shall be as follows:

18 1. Clevis Type:

19 Service: Bare Metal Pipe
20 Insulated Cold Pipe
21 Insulated Hot Pipe - 3 inches & Smaller

<u>Acceptable Products:</u>	<u>Bare Steel or Insulated Pipe</u>
Anvil	Fig. 260
Cooper/B-Line	Fig. 3100
Erico	Model 400
Nibco/Tolco	Fig. 1

22 2. Adjustable Swivel Ring Type:

23 Service: Bare Metal Pipe - 4 inches and Smaller

<u>Acceptable Products:</u>	<u>Bare Steel Pipe</u>
Anvil	Fig. 69
Cooper/B-Line	Fig. B3170NF
Erico	Model FCN
Nibco/Tolco	Fig. 200

24 J. Support may be fabricated from U-Channel strut or similar shapes. Piping less than 4" in
25 diameter shall be secured to strut with clamps of proper design and capacity as required to
26 maintain spacing and alignment. Strut shall be independently supported from hanger drops
27 or building structure. Size and support shall be per manufacturer's installation
28 requirements for structural support of piping. Clamps shall not interrupt piping insulation.

- 1 1. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633
2 electro-plated zinc finish.
- 3 K. Unless otherwise indicated, pipe supports for use with struts shall be as follows:
- 4 1. Clamp Type:
5 Service: Bare Metal Pipe
6 Insulated Cold Pipe
7 Insulated Hot Pipe - 3 inches and smaller
- 8 a. Clamps in direct contact with copper pipe shall be plastic coated.
- 9 b. Pipes subject to expansion and contraction shall have clamps slightly
10 oversized to allow limited pipe movement.
- | <u>Acceptable Products:</u> | <u>Bare Steel or Insulated Pipe</u> |
|-----------------------------|-------------------------------------|
| Unistrut | Fig. P1100 or P2500 |
| Cooper/B-Line | Fig. B2000 or B2400 |
| Nibco/Tolco | Fig. A-14 or 2STR |
- 11 L. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as
12 follows:
- 13 1. Beam Clamps:
- | <u>Acceptable Products:</u> | |
|-----------------------------|---------------|
| Anvil | Fig. 228, 292 |
| Cooper/B-Line | Fig. B3054 |
| Erico | Model 360 |
| Nibco/Tolco | Fig. 329 |
- 14 2. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors
15 designed per the requirements of Appendix D of ACI 318-05. Post-installed
16 anchors shall be qualified for use in cracked concrete by ACI-355.2.
- 17 3. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or
18 self-tapping masonry screws. For expansion anchors into hollow concrete block,
19 use sleeve-type anchors designed for the specific application. Do not fasten in
20 masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic
21 inserts.
- 22 M. Wall supports shall be used where vertical height of structure exceeds minimum spacing
23 requirements. Install wall supports at same spacing as hangers or strut supports along
24 vertical length of pipe runs.
- 25 N. Welding:
- 26 1. Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded
27 in lieu of bolting, clamping, or riveting to the building structural frame. Take
28 adequate precautions during all welding operations for fire prevention and for
29 protecting walls and ceilings from being damaged by smoke.

30 2.3 OPENINGS IN FLOORS, WALLS AND CEILINGS

- 31 A. Exact locations of all openings for the installation of materials shall be determined by the
32 Contractor and given to the General Contractor for installation or construction as the
33 structure is built.
- 34 B. Coordinate all openings with other Contractors.

- 1 C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in
2 or through existing structures, or openings in new structures that were not installed, or
3 additional openings. Repair all spalling and damage to the satisfaction of the
4 Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and
5 uniform opening edges.
- 6 D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate
7 openings with other Contractors shall not exempt the Contractor from providing openings
8 at his expense.
- 9 E. Do not cut structural members without written approval of the Architect or Structural
10 Engineer.
- 11 2.4 PIPE SLEEVES AND LINTELS
- 12 A. Each Contractor shall provide pipe sleeves and lintels for all openings required for the
13 Contractor's work in masonry walls and floors, unless specifically shown as being by
14 others.
- 15 B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings.
16 Provide continuous sleeve. Cut or split sleeves are not acceptable.
- 17 C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the
18 drawings. Have all lintels approved by the Architect or Structural Engineer.
- 19 D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed
20 squared ends extending 1" above the floor in unfinished areas, and flush with the floor in
21 finished areas, to accept spring closing floor plates.
- 22 E. Sleeves shall not penetrate structural members or masonry walls without approval from the
23 Structural Engineer. Sleeves shall then comply with the Architect/Engineer's design.
- 24 F. Openings through unexcavated floors and/or foundation walls below the floor shall have a
25 smooth finish with sufficient annular space around material passing through opening so
26 slight settling will not place stress on the material or building structure.
- 27 G. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This
28 Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- 29 H. Size sleeves large enough to allow expansion and contraction movement. Provide
30 continuous insulation wrapping.
- 31 2.5 ESCUTCHEON PLATES AND TRIM
- 32 A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors,
33 or ceilings of finished rooms.
- 34 B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium
35 plated finish, heavy spring clip, rigid hinge and latch.
- 36 C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and
37 raw construction edges of all rectangular openings in finished rooms. This includes pipe
38 openings.
- 39 2.6 PIPE PENETRATIONS
- 40 A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk.
41 Backing material may be used.

- 1 B. Seal fire rated wall and floor penetrations with fire seal system as specified.
- 2 2.7 PIPE ANCHORS
- 3 A. Provide all items needed to allow adequate expansion and contraction of all piping. All
4 piping shall be supported, guided, aligned, and anchored as required.
- 5 B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the
6 building.
- 7 2.8 FINISH
- 8 A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe
9 shafts, and suspended ceiling spaces are not considered exposed.

10 **PART 3 - EXECUTION**

11 3.1 PLUMBING SUPPORTS AND ANCHORS

- 12 A. General Installation Requirements:
- 13 1. Install all items per manufacturer's instructions.
- 14 2. Coordinate the location and method of support of piping systems with all
15 installations under other Divisions and Sections of the Specifications.
- 16 3. Where pipe support members are welded to structural building framing, scrape,
17 brush clean, and apply one coat of zinc rich primer to welding.
- 18 B. Supports Requirements:
- 19 1. Install roof pipe supports to resist wind movement per manufacturer's
20 recommendations. Method of securing base to roof shall be compatible with
21 roofing materials.
- 22 2. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel,
23 etc., which attach to it shall be installed prior to application of fireproofing.
24 Repair all fireproofing damaged during pipe installation.
- 25 3. Set all concrete inserts in place before pouring concrete.
- 26 4. Furnish, install and prime all auxiliary structural steel for support of piping
27 systems that are not shown on the Drawings as being by others.
- 28 5. Install hangers and supports complete with lock nuts, clamps, rods, bolts,
29 couplings, swivels, inserts and required accessories.
- 30 6. Hangers for horizontal piping shall have adequate means of vertical adjustment
31 for alignment.
- 32 C. Pipe Requirements:
- 33 1. Support all piping and equipment, including valves, strainers, traps and other
34 specialties and accessories to avoid objectionable or excessive stress, deflection,
35 swaying, sagging or vibration in the piping or building structure during erection,
36 cleaning, testing and normal operation of the systems.
- 37 2. Do not, however, restrain piping to cause it to snake or buckle between supports
38 or to prevent proper movement due to expansion and contraction.

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3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
 4. Piping shall not introduce strains or distortion to connected equipment.
 5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
 6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
 7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
 8. Provide at least one hanger adjacent to each joint in cast iron soil pipe, grooved end steel pipe with mechanical couplings, and glass pipe.
- D. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- E. Do not exceed the manufacturer's recommended maximum load for any hanger or support.
- F. Spacing of Hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:

	<u>Pipe Material</u>	<u>Maximum Spacing</u>
1.	Steel (Std. Weight or Heavier – Liquid Service):	
	1-1/4" & under	7'-0"
	1-1/2"	9'-0"
	2"	10'-0"
	2-1/2"	11'-0"
	3"	12'-0"
	4" & larger	12'-0"
2.	Steel (Std. Weight or Heavier – Vapor Service):	
	1-1/4" and under	9'-0"
	1-1/2"	12'-0"
	2" & larger	12'-0"
3.	Hard Drawn Copper & Brass (Liquid Service):	
	3/4" and under	5'-0"
	1"	6'-0"
	1-1/4"	7'-0"
	1-1/2"	8'-0"
	2"	8'-0"
	2-1/2"	9'-0"
4.	Cast Iron Soil Pipe - All Sizes:	
	Over 5' pipe lengths	10'-0"
	Less than 5' pipe lengths	5'-0"
	Support all direction changes and branch connections.	
5.	Installation of hangers shall conform to MSS SP-58 and the applicable Plumbing Code.	

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END OF SECTION

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SECTION 22 05 53 - PLUMBING IDENTIFICATION

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

- A. Identification of products installed under Division 22.

5

PART 2 - PRODUCTS

6

2.1 ACCEPTABLE MANUFACTURERS

7

- A. 3M, Bunting, Calpico, Craftmark, Emedco, Kolbi Industries, Seton, W.H. Brady, Marking Services.

8

9

2.2 MATERIALS

10

- A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

11

<u>O.D. of Pipe or insulation</u>	<u>Marker Length</u>	<u>Size of Letters</u>
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"

12

- B. Stencil Painted Pipe Markers: Use industrial enamel spray paint per ANSI Standard A13.1. Indicate fluid conveyed and flow direction.

13

14

PART 3 - EXECUTION

15

3.1 INSTALLATION

16

- A. Install all products per manufacturer's recommendations.

17

- B. Degrease and clean surfaces to receive adhesive for identification materials.

18

- C. Pipe Markers:

19

- 1. Stencil Painted Pipe Markers:

20

- a. Remove rust, grease, dirt, and all foreign substances from the pipe surface.

21

- b. Apply primer on non-insulated pipes before painting.

22

- c. Use background and letter colors as scheduled later in this section.

23

24

- 2. Apply markers and arrows in the following locations where clearly visible:

25

- a. At each valve.

26

- b. On both sides of walls that pipes penetrate.

27

- c. At least every 20 feet along all pipes.

28

- d. On each riser and each leg of each "T" joint.

29

- e. At least once in every room and each story traversed.

1 3.2 SCHEDULE

2 A. Pipes to be marked:

<u>Pipe Service</u>	<u>Lettering Color</u>	<u>Background Color</u>
Domestic Cold Water	White	Green
Domestic Hot Water - 115°F	Black	Yellow
Domestic Hot Water Circulating - 115°F	Black	Yellow
Sanitary Sewer	Black	Yellow
Vent	Black	Yellow
Storm Sewer (Primary and Secondary)	White	Green

3 END OF SECTION

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SECTION 22 07 19 - PLUMBING PIPING INSULATION

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Piping Insulation.
- 5 B. Insulation Jackets.

6 1.2 QUALITY ASSURANCE

- 7 A. Applicator: Company specializing in piping insulation application with five years
8 minimum experience.
- 9 B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84,
10 NFPA 255, or UL 723 (where required).

11 **PART 2 - PRODUCTS**

12 2.1 INSULATION

- 13 A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75°F; non-
14 combustible. All purpose, white kraft jacket bonded to aluminum foil and reinforced with
15 fiberglass yarn, 25/50 flame spread/smoke developed rating when tested in accordance with
16 ASTM E84 (UL 723).
- 17 B. Type C: Molded rigid cellular glass; ANSI/ASTM C-552; 0.35 maximum 'K' value at
18 75°F; moisture resistant, non-combustible; suitable for -100°F to +900°F. For below grade
19 installations use asphaltic mastic paper vapor barrier jacket. Use self-seal all-purpose
20 white kraft jacket for above grade installations.

21 2.2 VAPOR BARRIER JACKETS

- 22 A. Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Beach puncture
23 resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal
24 acrylic adhesive on longitudinal jacket laps and butt strips.

25 **PART 3 - EXECUTION**

26 3.1 PREPARATION

- 27 A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust
28 before applying insulation.

29 3.2 INSTALLATION

- 30 A. General Installation Requirements:
 - 31 1. Install materials per manufacturer's instructions, building codes and industry
32 standards.
 - 33 2. Continue insulation with vapor barrier through penetrations. This applies to all
34 insulated piping. Maintain fire rating of all penetrations.

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3. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a 180° cylindrical segment the same length as metal shields. Inserts shall be a cellular glass (for all temperature ranges) or molded hydrous calcium silicate (for pipe with operating temperatures above 70°F), with a minimum compressive strength of 50 psi. Polyisocyanurate insulation with a minimum compressive strength of 24 psi is acceptable for pipe sizes 3"75 and below, minimum 60 psi for pipe sizes 4" and above, and operate below 300°F. Factory fabricated inserts may be used. Rectangular blocks, plugs, or wood material are not acceptable. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor.
- 14
4. Neatly finish insulation at supports, protrusions, and interruptions.
- 15
5. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.
- 16
17
18
6. Shields shall be at least the following lengths and gauges:
- | | Pipe Size | Shield Size |
|----|----------------|---------------------|
| a. | 1/2" to 3-1/2" | 12" long x 18 gauge |
| b. | 4" | 12" long x 16 gauge |
| c. | 5" to 6" | 18" long x 16 gauge |
| d. | 8" to 14" | 24" long x 14 gauge |
| e. | 16" to 24" | 24" long x 12 gauge |
- 19
7. All piping and insulation that does not meet 25/50 that is located in an air plenum shall have written approval from the Authority Having Jurisdiction and the local fire department for authorization and materials approval. If approval has been allowed, the non-rated material shall be wrapped with a product that has passed ASTM E84 and/or NFPA 255 testing with a rating of 25/50 or below.
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24
8. On 1" and smaller piping routed through metal wall studs, provide a plastic grommet to protect the piping. The piping shall be insulated between the wall studs, and the insulation shall butt up to each stud.
- 25
26
27
- 28 B. Insulated Piping Operating Below 60°F:
- 29
1. Insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
- 30
- 31 C. Insulated Piping Operating Between 60°F and 140°F:
- 32
1. Do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.
- 33
- 34 D. Exposed Piping:
- 35
1. Locate and cover seams in least visible locations.
- 36
2. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be 0.016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.
- 37
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SECTION 22 10 00 - PLUMBING PIPING

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Pipe and Pipe Fittings.
- 5 B. Valves.
- 6 C. Domestic Water Piping System.
- 7 D. Sanitary Drainage and Vent Piping System.
- 8 E. Storm Drainage Piping System.

9 1.2 QUALITY ASSURANCE

- 10 A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured
- 11 valves are not acceptable.
- 12 B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor
- 13 regulations.
- 14 C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.
- 15 D. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be
- 16 lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

17 1.3 SUBMITTALS

- 18 A. Submit shop drawings per Section 22 05 00.

19 1.4 DELIVERY, STORAGE, AND HANDLING

- 20 A. Deliver and store valves in shipping containers with labeling in place.

21 **PART 2 - PRODUCTS**

22 2.1 COLD WATER - POTABLE AND NON-POTABLE

23 HOT WATER - POTABLE AND NON-POTABLE

- 24 A. Design Pressure: 175 psi.
- 25 Maximum Design Temperature: 200°F.
- 26 B. Piping - All Sizes:
 - 27 1. Tubing: Type L hard drawn seamless copper tube, ASTM B88.
 - 28 2. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
 - 29 3. Fittings: Wrought copper solder joint, ANSI B16.22.
- 30 C. Shutoff Valves:
 - 31 1. Ball Valves:
 - 32 a. BA-1:
 - 33 1) 3" and under, 150 psi saturated steam, 600 psi CWP, full port,
 - 34 screwed or solder ends (acceptable only if rated for soldering in

1 line with 470°F melting point of lead-free solder), bronze body
2 of a copper alloy containing less than 15% zinc, stainless steel
3 ball and trim, Teflon seats and seals. Apollo #77C-140,
4 Stockham #S-255-FB-P-UL BR1-R, Milwaukee #BA-400,
5 Watts, Nibco #585-70-66, National Utilities Co., RUB.

6 NOTES:

7 a) Provide extended shaft for all valves in insulated
8 piping.

9 2.2 SANITARY DRAINAGE (ABOVE GROUND)
10 SANITARY VENT (ABOVE GROUND)
11 STORM DRAINAGE (ABOVE GROUND)

12 A. Design Pressure: Gravity
13 Maximum Design Temperature: 180°F

14 B. Piping - 1-1/2" through 15":

15 1. Pipe and Fittings: Standard weight cast iron soil pipe, corrosion protective coating
16 inside and outside, CISPI 301 or ASTM A888.

17 2. Joints: Heavy duty, neoprene sleeve gasket, ASTM C-564, 300 Series stainless
18 steel shield, clamp, and screws with at least four screw type clamps, FM 1680 or
19 ASTM C1540.

20 3. Adapters: Transitions from cast iron soil pipe to other pipe materials with
21 manufactured adapters. Heavy duty neoprene sleeve gasket, ASTM C-564, 300
22 Series stainless steel shield, clamp, and screws with not less than four screw type
23 clamps, FM 1680 or ASTM C1540.

24 2.3 DRAIN VALVES

25 A. Drain valves shall be shutoff valves as specified for the intended service with added 3/4"
26 male hose thread outlet and cap.

27 2.4 CONNECTIONS BETWEEN DISSIMILAR METALS

28 A. Connections between dissimilar metals shall be insulating dielectric types that provide a
29 water gap between the connected metals, and that either allow no metal path for electron
30 transfer or that provide a wide water gap lined with a non-conductive material to impede
31 electron transfer through the water path.

32 B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in
33 which they are used, including testing procedure.

34 C. Aluminum, iron, steel, brass, copper, bronze, and stainless steel are commonly used and
35 require isolation from each other with the following exceptions:

36 1. Iron, steel, and stainless steel connected to each other.

37 2. Brass, copper, and bronze connected to each other.

38 3. Brass or bronze valves and specialties connected to steel, iron, or stainless steel in
39 closed systems. Where two brass or bronze items occur together, they shall be
40 connected with brass nipples.

- 1 D. Dielectric protection is required at connections to equipment of a material different than the
2 piping.
- 3 E. Screwed Joints (acceptable up to 2" size):
- 4 1. Dielectric waterway rated for 300 psi CWP and 225°F.
- 5 2. Acceptable Manufacturers: Elster Group ClearFlow fittings, Victaulic Series 47,
6 Grinnell Series 407, Matco-Norca.
- 7 F. Flanged Joints (any size):
- 8 1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
- 9 2. Employ one-piece molded sleeve-washer combinations to break the electrical path
10 through the bolts.
- 11 3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick
12 and washers minimum 1/8" thick.
- 13 4. Install steel washers on both sides of flanges to prevent damage to the
14 sleeve-washer.
- 15 5. Separate sleeves and washers may be used only if the sleeves are manufactured to
16 exact lengths and installed carefully so the sleeves must extend partially past each
17 steel washer when tightened.
- 18 6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator,
19 F. H. Maloney, or Calpico.
- 20 2.5 LOCK OUT TRIM
- 21 A. Provide lock out trim for all quarter turn shutoff valves opening to atmosphere and installed
22 in domestic water piping over 120°F, in compressed air piping, and as indicated on the
23 drawings.
- 24 2.6 VALVE OPERATORS
- 25 A. Provide handwheels for gate valves and gear operators for butterfly valves.
- 26 2.7 VALVE CONNECTIONS
- 27 A. Provide all connections to match pipe joints. Valves shall be same size as pipe unless noted
28 otherwise.

29 **PART 3 - EXECUTION**

30 3.1 PREPARATION

- 31 A. Install all products per manufacturer's recommendations.
- 32 B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- 33 C. Remove scale and dirt, on inside and outside, before assembly.
- 34 D. Connect to equipment with flanges or unions.
- 35 E. Use only piping materials rated for the maximum temperature of the application.

1 3.2 TESTING PIPING

2 A. Sanitary Drainage:
3 Sanitary Vent:
4 Storm Drainage:

- 5 1. Test all piping with water to prove tight.
- 6 2. Test piping before insulation is applied.
- 7 3. Hydrostatically test all soil, waste, and vent piping inside of building with 10 feet
8 head of water for 15 minutes. Inspect before fixtures are connected. If leaks
9 appear, repair them and repeat the test.
- 10 4. Hydrostatically test interior downspouts with 10 feet head of water for 15 minutes
11 with no leaks.
- 12 5. A smoke/air test at the same pressure may be used in lieu of the hydrostatic water
13 test. Exception: Smoke/air test shall not be performed on plastic piping.
- 14 6. Test force mains with water at 105% of the operating pump discharge pressure for
15 15 minutes.
- 16 7. Test pressures stated above shall be as listed or as required by the Authority
17 Having Jurisdiction, whichever is most stringent.

18 B. Hot Water - Potable and Non-Potable:
19 Cold Water - Potable and Non-Potable:
20 Service Water:

- 21 1. Test pipes underground or in chases and walls before piping is concealed.
- 22 2. Test all pipes before the insulation is applied. If insulation is applied before the
23 pipe is tested and a leak develops which ruins the insulation, replace damaged
24 insulation.
- 25 3. Test the pipe with 100 psig water pressure or equal inert gas such as nitrogen.
- 26 4. Hold test pressure for at least 2 hours.
- 27 5. Test to be witnessed by the Architect/Engineer's representative, if requested by
28 the Architect/Engineer.

29 C. All Other Piping:

- 30 1. Test piping at 150% of normal operating pressure.
- 31 2. Piping shall hold this pressure for one hour with no drop in pressure.
- 32 3. Test piping using water, nitrogen, or air as compatible with the final service of the
33 pipe. Do not use combustible fluids.
- 34 4. Drain and clean all piping after testing is complete.

1 3.3 CLEANING PIPING

2 A. Assembly:

- 3 1. Before assembling pipe systems, remove all loose dirt, scale, oil and other foreign
4 matter on internal or external surfaces by means consistent with good piping
5 practice subject to approval of the Architect/Engineer's representative. Blow
6 chips and burrs from machinery or thread cutting operation out of pipe before
7 assembly. Wipe cutting oil from internal and external surfaces.
- 8 2. During fabrication and assembly, remove slag and weld spatter from both internal
9 and external joints by peening, chipping and wire brushing.
- 10 3. Notify the Architect/Engineer's representative before starting any post erection
11 cleaning in sufficient time to allow witnessing the operation. Consult with and
12 obtain approval from the Architect/Engineer's representative with regard to
13 specific procedures and scheduling. Dispose of cleaning and flushing fluids
14 properly.
- 15 4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation
16 and equipment, open wide all valves, and be certain all strainer screens are in
17 place.

18 B. All Water Piping:

- 19 1. Flush all piping using faucets, flush valves, etc. until the flow is clean.
- 20 2. After flushing, thoroughly clean all inlet strainers, aerators, and other such
21 devices.
- 22 3. If necessary, remove valves to clean out all foreign material.

23 3.4 INSTALLATION

24 A. General Installation Requirements:

- 25 1. Provide dielectric connections between dissimilar metals.
- 26 2. Route piping in orderly manner and maintain gradient. Install to conserve
27 building space.
- 28 3. Group piping whenever practical at common elevations.
- 29 4. Install piping to allow for expansion and contraction without stressing pipe, joints,
30 or equipment.
- 31 5. Slope water piping and arrange to drain at low points.
- 32 6. Where pipe supports are welded to structural building framing, scrape, brush
33 clean, and apply one coat of zinc rich primer to welds.
- 34 7. All vertical pipe drops to sinks or other equipment installed below the ceiling shall
35 be routed within a wall cavity, unless specifically noted otherwise to be surface
36 mounted.

- 1 B. Installation Requirements In Electrical Rooms:
- 2 1. Do not install piping or other equipment above electrical switchboards or
- 3 panelboards. This includes a dedicated space extending 25 feet from the floor to
- 4 the structural ceiling with width and depth equal to the equipment.
- 5 C. Valves/Fittings and Accessories:
- 6 1. Provide clearance for installation of insulation and access to valves and fittings.
- 7 2. Provide access doors for concealed valves and fittings.
- 8 3. Install valve stems upright or horizontal, not inverted.
- 9 D. Sanitary and Storm Piping:
- 10 1. Install all sanitary piping inside the building with a slope of at least the following:
- | <u>Pipe Size</u> | <u>Minimum Slope</u> |
|------------------|----------------------|
| 3" and under | - 0.25" per foot |
| 4" and over | - 0.125" per foot |
- 11 3.5 PIPE ERECTION AND LAYING
- 12 A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation.
- 13 Any items that are unsuitable, cracked or otherwise defective shall be removed from the
- 14 job immediately.
- 15 B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings,
- 16 stampings, or nameplates with sufficient data to determine their conformance with
- 17 specified requirements.
- 18 C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of
- 19 foreign matter into piping, fittings, valves, equipment and accessories. Do not install any
- 20 item that is not clean.
- 21 D. Until system is fully operational, all openings in piping and equipment shall be kept closed
- 22 except when actual work is being performed on that item or system. Closures shall be
- 23 plugs, caps, blind flanges or other items specifically designed and intended for this
- 24 purpose.
- 25 E. Run pipes straight and true, parallel to building lines with minimum use of offsets and
- 26 couplings. Provide only offsets required to provide needed headroom or clearance and to
- 27 provide needed flexibility in pipe lines.
- 28 F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only
- 29 with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings
- 30 shall be of the long radius type, unless otherwise shown on the drawings or specified.
- 31 G. Provide flanges or unions at all final connections to equipment, traps and valves.
- 32 H. Arrange piping and connections so equipment served may be totally removed without
- 33 disturbing piping beyond final connections and associated shutoff valves.
- 34 I. Use full and double lengths of pipe wherever possible.
- 35 J. Unless otherwise indicated, install all piping, including shutoff valves and strainers, to
- 36 coils, pumps and other equipment at line size with reduction in size being made only at
- 37 control valve or equipment.

- 1 K. Cut all pipe to exact measurement and install without springing or forcing except in the
2 case of expansion loops where cold springing is indicated on the drawings.
- 3 L. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either
4 a 45° or 90° angle from the horizontal plane for air lines, and from top, bottom or side for
5 liquids.
- 6 3.6 DRAINING AND VENTING
- 7 A. Unless otherwise indicated on the drawings, all horizontal water and compressed air lines,
8 including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal
9 of condensate and venting.
- 10 B. Maintain accurate grade where pipes pitch or slope for venting and drainage. No pipes
11 shall have pockets due to changes in elevation.
- 12 C. Provide drain valves at all low points of water piping systems for complete or sectionalized
13 draining.
- 14 D. Provide drip legs at low points and at the base of all risers in compressed air pipes. Drip
15 legs shall be full line size on pipes through 4" and at least 4", but not less than half line size
16 over 4". Drip legs shall be 12" minimum length, capped with a reducer to a drain valve.
- 17 E. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper
18 drainage and venting. Install compressed air and gravity drain pipes with bottom of pipe
19 and eccentric reducers in a continuous line; all other liquid lines with top of pipe and
20 eccentric reducers in a continuous line.
- 21 F. Provide air vents at high points and wherever else required to eliminate air in all water
22 piping systems.
- 23 G. Install air vents in accessible locations. If necessary to trap and vent air in a remote
24 location, install an 1/8" pipe from the tapping location to an accessible location and
25 terminate with a venting device.
- 26 H. All vent and drain piping shall be of same materials and construction for the service
27 involved.
- 28 3.7 PLUMBING VENTS
- 29 A. Vent as shown on the drawings and in accordance with all codes having jurisdiction.
- 30 3.8 BRANCH CONNECTIONS
- 31 A. For domestic water and vent systems only, make branch connections with standard tee or
32 cross fittings of the type required for the service.
- 33 B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size
34 of the largest pipe shown connecting to it.
- 35 C. Do not use double wye or double combination wye and eighth bend DWV fittings in
36 horizontal piping.
- 37 D. Branch connections from the headers and mains may be mechanically formed using an
38 extraction device. The branch piping connection shall be brazed connection for the
39 following services only:
- 40 1. Domestic water piping above grade.

- 1 E. Further limit use of mechanically formed fittings as follows:
- 2 1. Must have at least same pressure rating as the main.
- 3 2. Main must be type K or L copper tubing.
- 4 3. Permanent marking shall indicate insertion depth and orientation.
- 5 4. Branch pipe shall conform to the inner curve of the piping main.
- 6 5. Main must be 1" or larger.
- 7 6. Branch must be 3/4" or larger.
- 8 F. Branch connections from headers and mains may be cut into black steel pipe using forged
- 9 weld-on fittings.
- 10 G. Forged weld-on fittings are limited as follows:
- 11 1. Must have at least same pressure rating as the main.
- 12 2. Main must be 2-1/2" or larger.
- 13 3. Branch line is at least two pipe sizes under main size.
- 14 3.9 JOINING OF PIPE
- 15 A. Threaded Joints:
- 16 1. Threads shall conform to ANSI B2.1 "Pipe Threads".
- 17 2. Ream pipe ends and remove all burrs and chips formed in cutting and threading.
- 18 3. Protect plated pipe and valve bodies from wrench marks when making up joints.
- 19 4. Apply thread lubricant to male threads as follows:
- Vents and Roof Conductors: Red graphite
- All Other Services: Teflon tape
- 20 B. Solder Joints:
- 21 1. Make up joints with 100% lead-free solder, ASTM B32. Cut tubing so ends are
- 22 perfectly square and remove all burrs inside and outside. Thoroughly clean
- 23 sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior
- 24 to soldering. Apply flux evenly, but sparingly, over all surfaces to be joined.
- 25 Heat joints uniformly so solder will flow to all mated surfaces. Wipe excess
- 26 solder, leaving a uniform fillet around cup of fitting.
- 27 2. Flux shall be non-acid type.
- 28 3. Solder end valves may be installed directly in the piping system if the entire valve
- 29 is suitable for use with 470°F melting point solder. Remove discs and seals during
- 30 soldering if they are not suitable for 470°F.
- 31 C. Sleeve Gaskets (No-Hub) (Sanitary and Storm Pipe):
- 32 1. Gasket shall be heavy weight class, conforming to ASTM C564.
- 33 2. The gasket shall have an internal center stop.
- 34 3. The gasket shall be covered by a stainless steel band secured with a minimum of
- 35 four stainless steel bands per fitting/joint.
- 36 4. Sleeve gaskets shall be installed in accordance with the manufacturer's installation
- 37 instructions.

1 3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- 2 A. Provide necessary connections at the start of individual sections of mains for adding
3 chlorine.
- 4 B. Before starting work, verify system is complete, flushed and clean.
- 5 C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or
6 soda ash) or acid (hydrochloric).
- 7 D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to
8 obtain 50 to 80 mg/L residual.
- 9 E. Bleed water from all outlets to ensure chlorine distribution throughout the entire domestic
10 water system.
- 11 F. Verify initial chlorination levels by testing at minimum 15% of outlets located throughout
12 entire building, including the last fixture connected to each main and each branch
13 extending over 50 feet from a main.
- 14 G. Maintain disinfectant in system for 24 hours, after which test at minimum 15% of outlets
15 located throughout entire building, including the last fixture connected to each main and
16 each branch extending over 50 feet from a main. If final disinfectant residual tests less
17 than 25 mg/L at any one of the tested outlets, flush the entire system and repeat disinfection
18 and testing procedure.
- 19 H. After final disinfectant residuals test at or above 25 mg/L after a minimum 24-hour
20 duration, flush disinfectant from system at a minimum velocity of 3.0 feet/second until
21 residual is equal to that of incoming water or 1.0 mg/L.
- 22 I. Take water samples, no sooner than 24 hours after flushing, from 2% of outlets and from
23 water entry. Obtain, analyze, and test samples in accordance with AWWA C651, Section 5
24 - Verification.

25

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SECTION 22 10 30 - PLUMBING SPECIALTIES

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Cleanouts.
- 5 B. Traps.
- 6 C. Trap Seals and Primers.
- 7 D. Water Hammer Arresters and Air Chambers.

8 1.2 QUALITY ASSURANCE

- 9 A. Manufacturer: For each product specified, provide components by same manufacturer
- 10 throughout.

11 1.3 SUBMITTALS

- 12 A. Submit shop drawings under provisions of Section 22 05 00.
- 13 B. Include sizes, rough-in requirements, service sizes, and finishes.

14 **PART 2 - PRODUCTS**

15 2.1 CLEANOUTS

- 16 A. Provide cleanouts as shown and specified on the drawings as well as required by code.
- 17 B. Coordinate floor cleanout cover with surrounding floor finish. Provide either solid,
- 18 recessed for tile or terrazzo or carpet marker as applicable.
- 19 C. Cleanouts on exposed pipes shall be cast iron with heavy duty cast brass plug with raised
- 20 head.
- 21 D. Cleanout shall be same size as the pipe up to 6" and 6" for larger pipes.

22 2.2 TRAPS

- 23 A. Provide all individual connections to the sanitary system with P-traps, except where such
- 24 drains discharge directly into a properly trapped collection basin or sump. Unless
- 25 otherwise specified or shown, traps shall be:
 - 26 1. Chromium plated cast brass when used with plumbing fixtures or when installed
 - 27 exposed in finished spaces.
 - 28 2. Insulated at accessible lavatories.
 - 29 3. Cast iron, deep-seal pattern where concealed above ceiling, below grade or in
 - 30 unfinished areas.
 - 31 4. Deep-seal pattern of the same material and/or coating where drainage lines are of
 - 32 special materials or coatings such as polypropylene, PVDF, CPVC, etc.
- 33 B. All traps shall have accessible, removable cleanouts, except where installed on floor drains
- 34 with removable strainers.

- 1 C. Each trap shall be completely filled with water at the end of construction but before space
2 turnover to the Owner. All floor drains, floor sinks, trench drains, etc. shall be filled with
3 water and a 1/2" minimum layer of mineral oil.
- 4 2.3 TRAP SEALS AND PRIMERS
- 5 A. Provide trap seals as specified on the drawings.
- 6 B. Provide trap primers as shown and specified on the drawings.
- 7 2.4 WATER HAMMER ARRESTERS AND AIR CHAMBERS
- 8 A. Provide water hammer arresters as shown and specified on the drawings as well as required
9 by code.
- 10 B. ANSI A112.26.1; sized and located in accordance with PDI WH-201, precharged for
11 operation between -100°F and 300°F and maximum 250 psig working pressure.
- 12 C. Air chambers shall meet the requirements of the applicable plumbing code. Minimum 12"
13 long at fixtures and minimum 24" long on risers. Air chambers shall be the same size or
14 larger than the piping it is connected to.

15 **PART 3 - EXECUTION**

16 3.1 INSTALLATION AND APPLICATION

- 17 A. Coordinate construction to receive drains at required invert elevations.
- 18 B. Install all items per manufacturer's instructions.
- 19 C. Water Hammer Arresters and Air Chambers:
- 20 1. Install water hammer arresters in accessible locations. Provide access doors as
21 required. Coordinate type with Architect/Engineer/Owner.
- 22 2. Water hammer arrestors shall be installed in cold and hot water lines upstream of
23 all plumbing fixtures or equipment, with a quick acting valve or multiple quick
24 acting valves. Quick acting valves shall be defined as solenoid actuated valves,
25 manual flush valves, sensor activated faucets and flush valves, squeeze handle
26 spray faucets, and other similar type valves.
- 27 3. Install multiple water hammer arrestors in toilet group branch piping greater than
28 20 feet in developed length from the cold and hot water mains.
- 29 4. Install air chambers at each fixture not protected by a water hammer arrester.
- 30 D. Cleanouts:
- 31 1. Provide cleanouts where shown on the drawings and as required by code, but in
32 no case farther apart than 50 feet in pipe less than 6" size and 100 feet apart in 6"
33 and larger pipes inside the building.
- 34 2. Provide cleanouts at bases of all sanitary and storm risers as shown on the
35 drawings and as required by code.
- 36 3. Extend cleanouts to the floor with long sweep elbows.

- 1
 - 2
 - 3
 - 4
 - 5
4. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with graphite and linseed oil. Ensure clearance at cleanouts for rodding of drainage system.
 5. Wall cleanouts shall be installed above the flow line of the pipe they serve, but no less than 12" above the finished floor.

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END OF SECTION

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SECTION 22 40 00 - PLUMBING FIXTURES

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

4 A. All plumbing fixtures.

5 1.2 SUBMITTALS

6 A. Submit product data under provisions of Section 22 05 00. Submittals shall include fixture
7 carriers for record purposes only. Architect/Engineer does not review or approve carriers
8 except for manufacturer.

9 B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

10 **PART 2 - PRODUCTS**

11 2.1 MATERIALS

12 A. Wall Hung Fixture Carriers:

13 1. Material: All Metal, ASME/ANSI A112.6.1M.

14 2. Acceptable Manufacturers: Zurn, Smith, Wade, Josam, Watts, Mifab.

15 3. Water closet carrier shall be rated to support 500 lbs. unless noted otherwise on
16 the drawings.

17 B. All fixtures shall be as scheduled on the drawings.

18 C. All fixtures shall be lead free. Faucets, traps, stops, and other fixture accessories shall not
19 contain more lead than allowed per the latest State or Federal Act.

20 **PART 3 - EXECUTION**

21 3.1 INSTALLATION

22 A. General Installation Requirements:

23 1. Review millwork shop drawings. Confirm location and size of fixtures and
24 openings before rough-in and installation.

25 2. Install each fixture with trap easily removable for servicing and cleaning. Use
26 screwed tailpiece couplings. Connect fixture waste to stack with slip fitting.

27 3. Provide fixtures with chrome plated rigid or flexible supplies, loose key stops,
28 reducers, and escutcheons.

29 4. Install components level and plumb.

30 5. Caulk joint between finish floor and floor mounted fixtures and between finish
31 walls and wall mounted fixtures with silicon caulk. Caulk the joint, between rim
32 and fixture where a fixture builds into a counter top, with caulking compound.
33 Refer to DIVISION 7 for "Caulking" requirements. Color to match fixture.

34 6. Where there is a possibility of water following pipe brackets, etc., into a wall;
35 caulk escutcheons, space around brackets, etc., to exclude water. Refer to
36 DIVISION 7 for "Caulking" requirements.

- 1 7. Refer to Plumbing Material List for fixture mounting heights.
- 2 B. Wall-Mounted Fixture Requirements:
- 3 1. All wall-mounted fixtures shall have compatible carriers designed for their
4 intended service and suitable for the space available and configuration of fixtures.
5 All carriers shall extend to the floor and be anchored to the slab.
- 6 C. Floor-Mounted Fixture Requirements:
- 7 1. Where floor mounted fixtures are installed on a sloped floor, the open void below
8 the fixture shall be grouted, leveled, and caulked to eliminate stress on the fixture
9 and to prevent water migration to the floor below.
- 10 D. Exposed or Inside Accessible Cabinets Traps, Valve and Pipe Requirements:
- 11 1. All traps exposed under fixtures or inside accessible cabinets shall be chrome
12 plated brass.
- 13 2. All water or waste piping for plumbing fixtures that is exposed or inside cabinets
14 shall be chrome plated.
- 15 3. All exposed flush valves for water closets and urinals shall have a chrome plated
16 hanger to anchor the piping to the wall.
- 17 4. All exposed water supply piping and fittings in a finished space to a shower valve,
18 hose bibb, or other water outlet shall be chrome plated.
- 19 E. ADA Lavatory Requirements:
- 20 1. All handicapped accessible lavatory traps, piping and angle stops shall be installed
21 with an insulating kit specially manufactured for this installation. Armaflex with
22 duct tape is not acceptable.
- 23 F. ADA Water Closet Requirements:
- 24 1. Handicapped accessible water closet flush valve handles shall face the center of
25 the stall.
- 26 2. Coordinate flush valves in handicap accessible locations with grab bars installed
27 by the General Contractor. Make modifications required to flush valve after
28 review by Architect/Engineer.
- 29 3.2 ADJUSTING AND CLEANING
- 30 A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or
31 overflow.
- 32 B. At completion, clean plumbing fixtures, equipment, and faucet aerator screens.
- 33 3.3 FIXTURE ROUGH-IN SCHEDULE
- 34 A. Rough-in fixture piping connections in accordance with table on plumbing drawings of
35 minimum sizes for particular fixtures.

36 END OF SECTION

DIVISION 23

1

SECTION 23 05 00 - BASIC HVAC REQUIREMENTS

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Requirements applicable to all Division 23 Sections. Also refer to Division 1 - General
- 5 Requirements.
- 6 B. All materials and installation methods shall conform to the applicable standards, guidelines
- 7 and codes referenced in the specification section.

8 1.2 SCOPE OF WORK

- 9 A. This Specification and the associated drawings govern the furnishing, installing, testing and
- 10 placing into satisfactory operation the Mechanical Systems.
- 11 B. Each Contractor shall provide all new materials indicated on the drawings and/or in these
- 12 specifications, and all items required to make his portion of the Mechanical Work a
- 13 finished and working system.
- 14 C. All work will be awarded under a single General Contract. Please refer to the General
- 15 Contractors scope statements for complete scope of work description.

16 1.3 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL

17 CONTRACTORS

18 A. Definitions:

- 19 1. "Mechanical Contractors" refers to the following:
 - 20 a. Plumbing Contractor.
 - 21 b. Heating Contractor.
 - 22 c. Air Conditioning and Ventilating Contractor.
 - 23 d. Fire Protection Contractor.
 - 24 e. Testing, Adjusting, and Balancing Contractor.
- 25 2. Motor Control Wiring: The wiring associated with the remote operation of the
- 26 magnetic coils of magnetic motor starters or relays, or the wiring that permits
- 27 direct cycling of motors by means of devices in series with the motor power
- 28 wiring. In the latter case the devices are usually single phase and are usually
- 29 connected to the motor power wiring through a manual motor starter having
- 30 "Manual-Off-Auto" provisions.
- 31 3. Control devices such as start-stop push buttons, thermostats, pressure switches,
- 32 flow switches, relays, etc., generally represent the types of equipment associated
- 33 with motor control wiring.
- 34 4. Motor control wiring is single phase and usually 120 volts. In some instances, the
- 35 voltage will be the same as the motor power wiring. Generally, where the motor
- 36 power wiring exceeds 120 volts, a control transformer is used to give a control
- 37 voltage of 120 volts.
- 38 5. Temperature Control Wiring: The wiring associated with the operation of a
- 39 motorized damper, solenoid valve or motorized valve, etc., either modulating or
- 40 two-position, as opposed to wiring which directly powers or controls a motor used
- 41 to drive equipment such as fans, pumps, etc.

- 1 a. This wiring will be from a 120 volt source and may continue as 120 volt,
2 or be reduced in voltage (24 volt) in which case a control transformer
3 shall be furnished as part of the temperature control wiring.
- 4 6. Control Motor: An electric device used to operate dampers, valves, etc. It may be
5 two-position or modulating. Conventional characteristics of such a motor are 24
6 volts, 60 cycles, 1 phase, although other voltages may be encountered.
- 7 B. General:
- 8 1. The purpose of these Specifications is to outline the Electrical and Mechanical
9 Contractor's responsibilities related to electrical work required for items such as
10 temperature controls, mechanical equipment, fans, chillers, compressors and the
11 like. The exact wiring requirements for much of the equipment cannot be
12 determined until the systems have been selected and submittals reviewed.
13 Therefore, the electrical drawings show only known wiring related to such items.
14 All wiring not shown on the electrical drawings, but required for mechanical
15 systems, is the responsibility of the Mechanical Contractor.
- 16 2. Where the drawings require the Electrical Contractor to wire between equipment
17 furnished by the Mechanical Contractor, such wiring shall terminate at terminals
18 provided in the equipment. The Mechanical Contractor shall provide complete
19 wiring diagrams and supervision to the Electrical Contractor and designate the
20 terminal numbers for correct wiring.
- 21 3. All electrical work shall conform to the National Electrical Code. All provisions
22 of the Electrical Specifications concerning wiring, protection, etc., apply to wiring
23 provided by the Mechanical Contractor unless noted otherwise.
- 24 4. All Contractors shall establish utility elevations prior to fabrication and shall
25 coordinate their material and equipment with other trades. When a conflict arises,
26 priority is as follows:
- 27 a. Light fixtures.
28 b. Gravity flow piping, including steam and condensate.
29 c. Electrical busduct.
30 d. Sheet metal.
31 e. Electrical cable trays, including access space.
32 f. Sprinkler piping and other piping.
33 g. Electrical conduits and wireway.
- 34 C. Mechanical Contractor's Responsibility:
- 35 1. Assumes responsibility for internal wiring of all equipment provided by the
36 Mechanical Contractor.
- 37 2. Assumes all responsibility for the Temperature Control wiring.
- 38 3. Shall verify all existing equipment sizes and capacities where units are to be
39 modified, moved or replaced. Contractor shall notify Architect/Engineer of any
40 discrepancies prior to ordering new units or replacement parts, including
41 replacements of equipment motors.
- 42 4. Wiring of all devices needed to make the Temperature Control System functional.
- 43 5. Verifying any control wiring on the electrical drawings as being by the Electrical
44 Contractor. All wiring required for the Control System, but not shown on the
45 electrical drawings is the responsibility of the Mechanical Contractor.

- 1 a. Coordinating equipment locations (such as relays, transformers, etc.)
2 with the Electrical Contractor, where wiring of the equipment is by the
3 Electrical Contractor.
- 4 6. This Contractor is responsible for coordination of utilities with all other
5 Contractors. If any field coordination conflicts are found, the Contractor shall
6 coordinate with other Contractors to determine a viable layout.
- 7 D. Electrical Contractor's Responsibility:
- 8 1. Provides all combination starters, manual starters and disconnect devices shown
9 on the Electrical Drawings or indicated to be by the Electrical Contractor on the
10 Mechanical Drawings or Specifications.
- 11 2. Installs and wires all remote control devices furnished by the Mechanical
12 Contractor when so noted on the Electrical Drawings.
- 13 3. Provides motor control and temperature control wiring, where so noted on the
14 drawings.
- 15 4. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain
16 fans upon actuation of the Fire Alarm System as indicated and specified in
17 Division 28.
- 18 5. This Contractor is responsible for coordination of utilities with all other
19 Contractors. If any field coordination conflicts are found, the Contractor shall
20 coordinate with other Contractors to determine a viable layout.

21 1.4 QUALITY ASSURANCE

22 A. Contractor's Responsibility Prior to Submitting Pricing Data:

- 23 1. The Contractor is responsible for constructing complete and operating systems.
24 The Contractor acknowledges and understands that the Contract Documents are a
25 two-dimensional representation of a three-dimensional object, subject to human
26 interpretation. This representation may include imperfect data, interpreted codes,
27 utility guidelines, three-dimensional conflicts, and required field coordination
28 items. Such deficiencies can be corrected when identified prior to ordering
29 material and starting installation. The Contractor agrees to carefully study and
30 compare the individual Contract Documents and report at once in writing to the
31 Design Team any deficiencies the Contractor may discover. The Contractor
32 further agrees to require each subcontractor to likewise study the documents and
33 report at once any deficiencies discovered.
- 34 2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer
35 prior to awarding any subcontracts, ordering material, or starting any work with
36 the Contractor's own employees. Any work performed prior to receipt of
37 instructions from the Design Team will be done at the Contractor's risk.

38 B. Qualifications:

- 39 1. Only products of reputable manufacturers are acceptable.
- 40 2. All Contractors and subcontractors shall employ only workers skilled in their
41 trades.

- 1 C. Compliance with Codes, Laws, Ordinances:
- 2 1. Conform to all requirements of the City of Madison, Wisconsin Codes, Laws,
3 Ordinances and other regulations having jurisdiction.
- 4 2. Conform to all State Codes.
- 5 3. If there is a discrepancy between the codes and regulations and these
6 specifications, the Architect/Engineer shall determine the method or equipment
7 used.
- 8 4. If the Contractor notes, at the time of bidding, any parts of the drawings or
9 specifications that do not comply with the codes or regulations, he shall inform the
10 Architect/Engineer in writing, requesting a clarification. If there is insufficient
11 time for this procedure, he shall submit with his proposal a separate price to make
12 the system comply with the codes and regulations.
- 13 5. All changes to the system made after letting of the contract, to comply with codes
14 or requirements of Inspectors, shall be made by the Contractor without cost to the
15 Owner.
- 16 6. If there is a discrepancy between manufacturer's recommendations and these
17 specifications, the manufacturer's recommendations shall govern.
- 18 7. All rotating shafts and/or equipment shall be completely guarded from all contact.
19 Partial guards and/or guards that do not meet all applicable OSHA standards are
20 not acceptable. Contractor is responsible for providing this guarding if it is not
21 provided with the equipment supplied.
- 22 D. Permits, Fees, Taxes, Inspections:
- 23 1. Procure all applicable permits and licenses.
- 24 2. Abide by all laws, regulations, ordinances, and other rules of the State or Political
25 Subdivision where the work is done, or as required by any duly constituted public
26 authority.
- 27 3. Pay all charges for permits or licenses.
- 28 4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory
29 bodies.
- 30 5. Pay all charges arising out of required inspections by an authorized body.
- 31 6. Pay all charges arising out of required contract document reviews associated with
32 the project and as initiated by the Owner or authorized agency/consultant.
- 33 7. Where applicable, all fixtures, equipment and materials shall be approved or listed
34 by Underwriter's Laboratories, Inc.
- 35 E. Examination of Drawings:
- 36 1. The drawings for the mechanical work are completely diagrammatic, intended to
37 convey the scope of the work and to indicate the general arrangements and
38 locations of equipment, outlets, etc., and the approximate sizes of equipment.
- 39 2. Contractor shall determine the exact locations of equipment and rough-ins, and the
40 exact routing of pipes and ducts to best fit the layout of the job.

- 1 3. Scaling of the drawings is not sufficient or accurate for determining these
2 locations.
- 3 4. Where job conditions require reasonable changes in indicated arrangements and
4 locations, such changes shall be made by the Contractor at no additional cost to
5 the Owner.
- 6 5. Because of the scale of the drawings, certain basic items, such as fittings, boxes,
7 valves, unions, etc., may not be shown, but where required by other sections of the
8 specifications or required for proper installation of the work, such items shall be
9 furnished and installed.
- 10 6. If an item is either on the drawings or in the specifications, it shall be included in
11 this contract.
- 12 7. Determination of quantities of material and equipment required shall be made by
13 the Contractor from the documents. Where discrepancies arise between drawings,
14 schedules and/or specifications, the greater number shall govern.
- 15 8. Where used in mechanical documents, the word "furnish" shall mean supply for
16 use, the word "install" shall mean connect complete and ready for operation, and
17 the word "provide" shall mean to supply for use and connect complete and ready
18 for operation.
- 19 a. Any item listed as furnished shall also be installed, unless otherwise
20 noted.
- 21 b. Any item listed as installed shall also be furnished, unless otherwise
22 noted.
- 23 F. Field Measurements:
- 24 1. Verify all pertinent dimensions at the job site before ordering any materials or
25 fabricating any supports, pipes or ducts.
- 26 G. Electronic Media/Files:
- 27 1. Construction drawings for this project have been prepared utilizing Revit.
- 28 2. Contractors and Subcontractors may request electronic media files of the contract
29 drawings and/or copies of the specifications. Specifications will be provided in
30 PDF format.
- 31 3. Upon request for electronic media, the Contractor shall complete and return a
32 signed "Electronic File Transmittal" form provided by KJWW.
- 33 4. If the information requested includes floor plans prepared by others, the
34 Contractor will be responsible for obtaining approval from the appropriate Design
35 Professional for use of that part of the document.
- 36 5. The electronic contract documents can be used for preparation of shop drawings
37 and as-built drawings only. The information may not be used in whole or in part
38 for any other project.
- 39 6. The drawings prepared by KJWW for bidding purposes may not be used directly
40 for ductwork layout drawings or coordination drawings.
- 41 7. The use of these CAD documents by the Contractor does not relieve them from
42 their responsibility for coordination of work with other trades and verification of
43 space available for the installation.

1 8. The information is provided to expedite the project and assist the Contractor with
2 no guarantee by KJWW as to the accuracy or correctness of the information
3 provided. KJWW accepts no responsibility or liability for the Contractor's use of
4 these documents.

5 1.5 SUBMITTALS

6 A. Submittals shall be required for the following items, and for additional items where
7 required elsewhere in the specifications or on the drawings.

8 1. Submittals list:

<u>Referenced Specification Section</u>	<u>Submittal Item</u>
23 05 93	Testing, Adjusting, and Balancing
23 34 23	Power Ventilators
23 37 00	Grilles, Registers, and Diffusers
23 82 00	Terminal Heat Transfer Equipment

9 B. General Submittal Procedures: In addition to the provisions of Division 1, the following are
10 required:

11 1. Transmittal: Each transmittal shall include the following:

- 12 a. Date
- 13 b. Project title and number
- 14 c. Contractor's name and address
- 15 d. Division of work (e.g., plumbing, heating, ventilating, etc.)
- 16 e. Description of items submitted and relevant specification number
- 17 f. Notations of deviations from the contract documents
- 18 g. Other pertinent data

19 2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

- 20 a. Date
- 21 b. Project title and number
- 22 c. Architect/Engineer
- 23 d. Contractor and subcontractors' names and addresses
- 24 e. Supplier and manufacturer's names and addresses
- 25 f. Division of work (e.g., plumbing, heating, ventilating, etc.)
- 26 g. Description of item submitted (using project nomenclature) and relevant
27 specification number
- 28 h. Notations of deviations from the contract documents
- 29 i. Other pertinent data
- 30 j. Provide space for Contractor's review stamps

31 3. Composition:

- 32 a. Submittals shall be submitted using specification sections and the project
33 nomenclature for each item.
- 34 b. Individual submittal packages shall be prepared for items in each
35 specification section. All items within a single specification section shall
36 be packaged together where possible. An individual submittal may
37 contain items from multiple specifications sections if the items are
38 intimately linked (e.g., pumps and motors).
- 39 c. All sets shall contain an index of the items enclosed with a general topic
40 description on the cover.

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4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
- 8
5. Contractor's Approval Stamp:
- 9
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11
- a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
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- b. Unstamped submittals will be rejected.
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- c. The Contractor's review shall include, but not be limited to, verification of the following:
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- 1) Only approved manufacturers are used.
2) Addenda items have been incorporated.
3) Catalog numbers and options match those specified.
4) Performance data matches that specified.
5) Electrical characteristics and loads match those specified.
6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
7) Dimensions and service clearances are suitable for the intended location.
8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).
- 29
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- d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
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- e. **The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.**
- 38
6. Submittal Identification and Markings:
- 39
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- a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
- 41
- b. The Contractor shall clearly indicate the size, finish, material, etc.
- 42
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- c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
- 45
- d. All marks and identifications on the submittals shall be unambiguous.

- 1 7. Schedule submittals to expedite the project. Coordinate submission of related
2 items.
- 3 8. Identify variations from the contract documents and product or system limitations
4 that may be detrimental to the successful performance of the completed work.
- 5 9. Reproduction of contract documents alone is not acceptable for submittals.
- 6 10. Incomplete submittals will be rejected without review. Partial submittals will only
7 be reviewed with prior approval from the Architect/Engineer.
- 8 11. Submittals not required by the contract documents may be returned without
9 review.
- 10 12. The Architect/Engineer's responsibility shall be to review one set of shop drawing
11 submittals for each product. If the first submittal is incomplete or does not
12 comply with the drawings and/or specifications, the Contractor shall be
13 responsible to bear the cost for the Architect/Engineer to recheck and handle the
14 additional shop drawing submittals.
- 15 13. Submittals shall be reviewed and approved by the Architect/Engineer **before**
16 releasing any equipment for manufacture or shipment.
- 17 14. Contractor's responsibility for errors, omissions or deviation from the contract
18 documents in submittals is not relieved by the Architect/Engineer's approval.
- 19 C. Electronic Submittal Procedures:
- 20 1. Distribution: Email submittals as attachments to all parties designated by the
21 Architect/Engineer, unless a web-based submittal program is used.
- 22 2. Transmittals: Each submittal shall include an individual electronic letter of
23 transmittal.
- 24 3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in
25 PDF format, of paper originals are acceptable. Submittals that are not legible will
26 be rejected. Do not set any permission restrictions on files; protected, locked, or
27 secured documents will be rejected.
- 28 4. File Names: Electronic submittal file names shall include the relevant
29 specification section number followed by a description of the item submitted, as
30 follows. Where possible, include the transmittal as the first page of the PDF
31 instead of using multiple electronic files.
- 32 a. Submittal file name: 23 XX XX.description.YYYYMMDD
33 b. Transmittal file name: 23 XX XX.description.YYYYMMDD
- 34 5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files
35 shall be transmitted via a pre-approved method.

36 1.6 CHANGE ORDERS

- 37 A. A detailed material and labor takeoff shall be prepared for each change order, along with
38 labor rates and markup percentages. Change orders with inadequate breakdown will be
39 rejected.
- 40 B. Change order work shall not proceed until authorized.

1 1.7 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

2 A. Exercise care in transporting and handling to avoid damage to materials. Store materials
3 on the site to prevent damage. Keep materials clean, dry and free from harmful conditions.
4 Immediately remove any materials that become wet or that are suspected of becoming
5 contaminated with mold or other organisms.

6 B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.

7 C. Coordinate the installation of heavy and large equipment with the General Contractor
8 and/or Owner. If the Mechanical Contractor does not have prior documented experience in
9 rigging and lifting similar equipment, he/she shall contract with a qualified lifting and
10 rigging service that has similar documented experience. Follow all equipment lifting and
11 support guidelines for handling and moving.

12 D. Contractor is responsible for moving equipment into the building and/or site. Contractor
13 shall review site prior to bid for path locations and any required building modifications to
14 allow movement of equipment. Contractor shall coordinate his/her work with other trades.

15 1.8 WARRANTY

16 A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures,
17 equipment, materials, and workmanship.

18 B. The warranty period for all work in this Division of the specifications shall commence on
19 the date of final acceptance, unless a whole or partial system or any separate piece of
20 equipment or component is put into use for the benefit of any party other than the installing
21 contractor with prior written authorization. In this instance, the warranty period shall
22 commence on the date when such whole system, partial system or separate piece of
23 equipment or component is placed in operation and accepted in writing by the Owner.

24 C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work
25 found to be defective or nonconforming to the contract documents. The Contractor shall
26 bear the cost of correcting all damage resulting from defects or nonconformance with
27 contract documents.

28 1.9 INSURANCE

29 A. Contractor shall maintain insurance coverage as set forth in Division 0 of these
30 specifications.

31 1.10 MATERIAL SUBSTITUTION

32 A. Where several manufacturers' names are given, the manufacturer for which a catalog
33 number is given is the basis for job design and establishes the quality required.

34 B. Equivalent equipment manufactured by the other named manufacturers may be used.
35 Contractor shall ensure that all items submitted by these other manufacturers meet all
36 requirements of the drawings and specifications, and fits in the allocated space.

37 C. Any material, article or equipment of other unnamed manufacturers which will adequately
38 perform the services and duties imposed by the design and is of a quality equal to or better
39 than the material, article or equipment identified by the drawings and specifications may be
40 used if approval is secured in writing from the Architect/Engineer not later than ten days
41 prior to the bid opening.

42 D. This Contractor assumes all costs incurred as a result of using the offered material, article
43 or equipment, on his part or on the part of other Contractors whose work is affected.

- 1 E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid
2 form. These items will not be used in determining the low bidder.
- 3 F. All material substitutions requested later than ten (10) days prior to bid opening must be
4 listed as voluntary changes on the bid form.

5 **PART 2 - PRODUCTS**

6 NOT APPLICABLE

7 **PART 3 - EXECUTION**

8 3.1 JOBSITE SAFETY

9 A. Neither the professional activities of the Architect/Engineer, nor the presence of the
10 Architect/Engineer or his or her employee and subconsultants at a construction site, shall
11 relieve the Contractor and other entity of their obligations, duties and responsibilities
12 including, but not limited to, construction means, methods, sequence, techniques or
13 procedures necessary for performing, superintending or coordinating all portions of the
14 work of construction in accordance with the contract documents and any health or safety
15 precautions required by any regulatory agencies. The Architect/Engineer and his or her
16 personnel have no authority to exercise any control over any construction contractor or
17 other entity or their employees in connection with their work or any health or safety
18 precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer
19 and the Architect/Engineer's consultants shall be indemnified and shall be made additional
20 insureds under the Contractor's general liability insurance policy.

21 3.2 PROJECT CLOSEOUT

22 A. The following paragraphs supplement the requirements of Division 1.

23 B. Final Jobsite Observation:

- 24 1. In order to prevent the Final Jobsite Observation from occurring too early, the
25 Contractor is required to review the completion status of the project and certify
26 that the job is ready for the final jobsite observation.
- 27 2. Attached to the end of this section is a typical list of items that represent the
28 degree of job completeness expected prior to requesting a review.
- 29 3. Upon Contractor certification that the project is complete and ready for a final
30 observation, the Contractor shall sign the attached certification and return it to the
31 Architect/Engineer so that the final observation can be scheduled.
- 32 4. It is understood that if the Architect/Engineer finds the job not ready for the final
33 observation and that additional trips and observations are required to bring the
34 project to completion, the costs incurred by the Architect/Engineer's additional
35 time and expenses will be deducted from the Contractor's contract retainage prior
36 to final payment at the completion of the job.

37 C. Before final payment is authorized, this Contractor must submit the following:

- 38 1. Operation and maintenance manuals with copies of approved shop drawings.
- 39 2. Record documents including marked-up or reproducible drawings and
40 specifications.

1 3. A report documenting the instructions given to the Owner's representatives
2 complete with the number of hours spent in the instruction. The report shall bear
3 the signature of an authorized agent of This Contractor and shall be signed by the
4 Owner's representatives.

5 4. Start-up reports on all equipment requiring a factory installation inspection or
6 start-up.

7 3.3 INSTRUCTING THE OWNER'S REPRESENTATIVES

8 A. Adequately instruct the Owner's designated representatives in the maintenance, care, and
9 operation of all systems installed under this contract.

10 B. Provide verbal and written instructions to the Owner's representatives by FACTORY
11 PERSONNEL in the care, maintenance, and operation of the equipment and systems.

12 C. The Owner has the option to make a video recording of all instructions. Coordinate
13 schedule of instructions to facilitate this recording.

14 D. The instructions shall include:

- 15 1. Explanation of all air handling systems.
- 16 2. Temperature control system operation including calibration, adjustment and
17 proper operating conditions of all sensors.
- 18 3. Maintenance of equipment.

19 E. The Architect/Engineer shall be notified of the time and place instructions will be given to
20 the Owner's representatives so he or his representative can attend if desired.

21 F. Minimum hours of instruction for each item shall be:

- 22 1. Exhaust System(s) - 1 hour.
- 23 2. Temperature Controls - As defined in Section 23 09 00.

24 G. The Contractor shall prepare a detailed, written training agenda and submit it to the
25 Architect/Engineer a minimum of two weeks prior to the formal training for approval. The
26 written agenda shall include specific training points within the items described above. For
27 example: how to adjust setpoints, troubleshooting, proper start-up, proper shut-down,
28 seasonal changes, draining, venting, changing filters, changing belts, etc. Failure to
29 provide and follow an approved training agenda may result in additional training required
30 at the expense of the Contractor.

31 H. Operating Instructions:

- 32 1. Contractor is responsible for all instructions to the Owner's representatives for the
33 mechanical and control systems.
- 34 2. If the Contractor does not have staff that can adequately provide the required
35 instructions he shall include in his bid an adequate amount to reimburse the
36 Owner for the Architect/Engineer to perform these services.

37 3.4 SYSTEM COMMISSIONING

38 A. The mechanical systems shall be complete and operating. System start-up, testing,
39 balancing, and satisfactory system performance is the responsibility of the Contractor. This
40 includes calibration and adjustments of all controls, noise level adjustments and final
41 comfort adjustments as required.

- 1 B. Operate all HVAC systems continuously for at least one week prior to occupancy to bring
2 construction materials to suitable moisture levels. Areas with mechanical cooling shall be
3 maintained below 60% RH.
- 4 C. Contractor shall adjust the mechanical systems and controls at season changes during the
5 one year warranty period, as required, to provide satisfactory operation and to prove
6 performance of all systems in all seasons.
- 7 D. All operating conditions and control sequences shall be tested during the start-up period.
8 Test all interlocks, safety shutdowns, controls, and alarms.
- 9 E. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to
10 ensure that all systems perform properly. If the Architect/Engineer is requested to visit the
11 job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment
12 operation, resolving installation and/or workmanship problems, equipment substitution
13 issues or unsatisfactory system performance, including call backs during the warranty
14 period, through no fault of the design; the Contractor shall reimburse the Owner on a time
15 and materials basis for services rendered at the Architect/Engineer's standard hourly rates
16 in effect when the services are requested. The Contractor shall pay the Owner for services
17 required that are product, installation or workmanship related. Payment is due within 30
18 days after services are rendered.

19 3.5 RECORD DOCUMENTS

- 20 A. The following paragraph supplements Division 1 requirements:
- 21 Contractor shall maintain at the job site a separate and complete set of mechanical
22 drawings and specifications on which he shall clearly and permanently mark in complete
23 detail all changes made to the mechanical systems.
- 24 B. Mark drawings to indicate revisions to piping and ductwork, size and location, both
25 exterior and interior; including locations of coils, dampers, other control devices, filters,
26 and other units requiring periodic maintenance or repair; actual equipment locations,
27 dimensioned from column lines; actual inverts and locations of underground piping;
28 concealed equipment, dimensioned from column lines; mains and branches of piping
29 systems, with valves and control devices located and numbered, concealed unions located,
30 and with items requiring maintenance located (e.g., traps, strainers, expansion
31 compensators, tanks, etc.); Change Orders; concealed control system devices.
- 32 C. Refer to Section 23 09 00 for additional requirements for Temperature Control documents.

33 3.6 PAINTING

- 34 A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and
35 color shall match original equipment paint and shall be obtained from the equipment
36 supplier if available.
- 37 B. Equipment in finished areas that will be painted to match the room decor will be painted by
38 others. Should this Contractor install equipment in a finished area after the area has been
39 painted, he shall have the equipment and all its supports, hangers, etc., painted to match the
40 room decor.
- 41 C. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed
42 spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips,
43 etc.

- 1 D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with
2 baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is
3 specified or is standard to the unit, this Contractor shall, before ordering, verify with the
4 Architect/Engineer his color preference and furnish this color.
- 5 E. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage
6 room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint
7 and enamel need not be painted, provided the factory applied finish is not marred or
8 spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- 9 F. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign
10 matter; paint all pipes and equipment with the following:
- 11 1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being
12 painted. Finish with two coats of Alkyd base enamel paint.
- 13 2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic
14 latex paint.
- 15 3.7 ADJUST AND CLEAN
- 16 A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the
17 project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material
18 from all equipment.
- 19 B. Clean all drain pans and areas where moisture is present. Immediately report any mold,
20 biological growth, or water damage.
- 21 C. Remove all rubbish, debris, etc., accumulated during construction from the premises.
- 22 3.8 SPECIAL REQUIREMENTS
- 23 A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators,
24 etc., with other trades to maintain clear access area for servicing.
- 25 B. All equipment shall be installed in such a way to maximize access to parts needing service
26 or maintenance. Review the final field location, placement, and orientation of equipment
27 with the Owner's designated representative prior to setting equipment.
- 28 C. Installation of equipment or devices without regard to coordination of access requirements
29 and confirmation with the Owner's designated representative will result in removal and
30 reinstallation of the equipment at the Contractor's expense.
- 31 3.9 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION
- 32 A. Contractors shall make all reasonable efforts to prevent construction activities from
33 affecting the air quality of the occupied areas of the building or outdoor areas near the
34 building. These measures shall include, but not be limited to:
- 35 1. All contractors shall endeavor to minimize the amount of contaminants generated
36 during construction. Methods to be employed shall include, but not be limited to:
- 37 a. Minimizing the amount of dust generated.
38 b. Reducing solvent fumes and VOC emissions.
39 c. Maintain good housekeeping practices, including sweeping and periodic
40 dust and debris removal. There should be no visible haze in the air.
41 d. Protect stored on-site and installed absorptive materials from moisture
42 damage.

- 1 2. Request that the Owner designate an IAQ representative.
- 2 3. Review and receive approval from the Owner’s IAQ representative for all IAQ-
- 3 3. related construction activities and negative pressure containment plans.
- 4 4. Inform the IAQ representative of all conditions that could adversely impact IAQ,
- 5 4. including operations that will produce higher than normal dust production or
- 6 4. odors.
- 7 5. Schedule activities that may cause IAQ conditions that are not acceptable to the
- 8 5. Owner’s IAQ representative during unoccupied periods.
- 9 6. Request copies of and follow all of the Owner’s IAQ and infection control
- 10 6. policies.
- 11 7. Unless no other access is possible, the entrance to construction site shall not be
- 12 7. through the existing facility.
- 13 8. To minimize growth of infectious organisms, do not permit damp areas in or near
- 14 8. the construction area to remain for over 24 hours.
- 15 9. In addition to the criteria above, provide measures as recommended in the
- 16 9. SMACNA “IAQ Guidelines for Occupied Buildings Under Construction”.
- 17 10. If permanently installed air handlers are used during construction, MERV 8
- 18 10. filtration media must be used to protect each return air grille or opening. The
- 19 10. intent of this will be to prevent construction dust and debris from entering any
- 20 10. return or supply air ductwork in the facility. All filtration media must be replaced
- 21 10. immediately prior to occupancy.

22

END OF SECTION

1

SECTION 23 05 03 - THROUGH PENETRATION FIRESTOPPING

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Through-Penetration Firestopping.

5

1.2 QUALITY ASSURANCE

6

A. Manufacturer: Company specializing in manufacturing products specified in this Section.

7

B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

8

9

1.3 DELIVERY, STORAGE, AND HANDLING

10

A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer’s instructions for storage.

11

12

13

14

B. Install material prior to expiration of product shelf life.

15

1.4 PERFORMANCE REQUIREMENTS

16

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

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1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.

22

23

24

2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.

25

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:

26

27

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

28

29

30

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings:

31

32

a. Floor penetrations located outside wall cavities.

33

b. Floor penetrations located outside fire-resistance-rated shaft enclosures.

34

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

35

36

37

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

38

39

1 E. For through-penetration firestop systems in air plenums, provide products with flame-
2 spread and smoke-developed indexes of less than 25 and 50, respectively, as determined
3 per ASTM E 84.

4 1.5 WARRANTY

5 A. Provide one year warranty on parts and labor.

6 B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion,
7 cohesion, abrasion resistance, weather resistance, extrusion resistance, migration
8 resistance, stain resistance, general durability, or appear to deteriorate in any manner not
9 clearly specified by the manufacturer as an inherent quality of the material.

10 **PART 2 - PRODUCTS**

11 2.1 MANUFACTURERS

12 A. Products: Subject to compliance with requirements, provide one of the through-penetration
13 firestop systems indicated for each application that are produced by one of the following
14 manufacturers. All firestopping systems installed shall be provided by a single
15 manufacturer.

- 16 1. 3M; Fire Protection Produces Division.
- 17 2. Hilti, Inc.
- 18 3. RectorSeal Corporation, Metacaulk.
- 19 4. Tremco; Sealant/Weatherproofing Division.
- 20 5. Johns-Manville.
- 21 6. Specified Technologies Inc. (S.T.I.)
- 22 7. Spec Seal Firestop Products
- 23 8. AD Firebarrier Protection Systems

24 2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

25 A. Provide materials and systems classified by or listed by Warnock Hersey to provide
26 firestopping equal to time rating of construction being penetrated.

27 B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that
28 would require hazardous waste removal.

29 C. Firestopping shall be flexible to allow for normal penetrating item movement due to
30 expansion and contraction.

31 D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture
32 resistant.

33 E. Provide firestopping systems capable of supporting floor loads where systems are exposed
34 to possible floor loading or traffic.

35 F. Provide firestopping systems allowing continuous insulation for all insulated pipes.

36 G. Provide firestopping systems classified by UL or listed by Warnock Hersey for
37 penetrations through all fire rated construction. Firestopping systems shall be selected
38 from the UL or listed by Warnock Hersey Fire Resistance Directory Category XHEZ based
39 on substrate construction and penetrating item size and material and shall fall within the
40 range of numbers listed:

- 1 1. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated
 2 F Rating = Wall/Floor Rating
 3 T Rating (Floors) = Floor Rating

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

4 *Alternate method of firestopping is patching opening to match original rated
 5 construction.

6 H. Any opening in walls or floors not covered by the listed series of numbers shall be
 7 coordinated with the firestopping manufacturer.

8 I. Any openings in floors or walls not described in the UL or listed by Warnock Hersey Fire
 9 Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner
 10 agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having
 11 Jurisdiction.

12 **PART 3 - EXECUTION**

13 3.1 EXAMINATION

14 A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose
 15 materials. Clean and repair surfaces as required. Remove laitance and form-release agents
 16 from concrete.

17 B. Ensure substrate and penetrating items have been permanently installed prior to installing
 18 firestopping systems. Ensure penetrating items have been properly spaced and have proper
 19 clearance prior to installing firestopping systems.

20 C. Surfaces to which sealing materials are to be installed must meet the selected UL or
 21 Warnock Hersey system substrate criteria.

22 D. Prime substrates where recommended in writing by through-penetration firestop system
 23 manufacturer. Confine primer to area of bond.

24 3.2 INSTALLATION

25 A. In existing construction, provide firestopping of openings prior to and after installation of
 26 penetrating items. Remove any existing coatings on surfaces prior to firestopping
 27 installation. Temporary firestopping shall consist of packing openings with fire resistant
 28 mineral wool for the full thickness of substrate, or an alternate method approved by the
 29 Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately
 30 upon their installation and shall remain so until the permanent UL or listed by Warnock
 31 Hersey listed firestopping system is installed.

32 B. Install penetration seal materials in accordance with printed instructions of the UL or
 33 Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application
 34 instructions.

1 C. Install dams as required to properly contain firestopping materials within openings and as
2 required to achieve required fire resistance rating. Remove combustible damming after
3 appropriate curing.

4 3.3 CLEANING AND PROTECTING

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

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

13 3.4 INSPECTION

14 A. All penetrations shall be inspected by the manufacturer's representative to ensure proper
15 installation.

16 B. Access to firestop systems shall be maintained for examination by the Authority Having
17 Jurisdiction at their request.

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

20 D. The contractor shall allow for visual destructive review of 5% of installed firestop systems
21 (minimum of one) to prove compliance with specifications and manufacturer's instructions
22 and details. Destructive system removal shall be performed by the contractor and
23 witnessed by the Architect/Engineer and manufacturer's factory representative. The
24 Architect/Engineer shall have sole discretion of which firestop system installations will be
25 reviewed. The contractor is responsible for all costs associated with this requirement
26 including labor and material for removing and replacing the installed firestop system. If
27 any firestop system is found to not be installed per manufacturer's specific instructions and
28 details, all firestop systems are subject to destructive review and replacement at the
29 Architect/Engineer's discretion and the contractor's expense.

30 END OF SECTION

1

SECTION 23 05 05 - HVAC DEMOLITION FOR REMODELING

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Mechanical demolition.
- 5 B. Cutting and Patching.

6 **PART 2 - PRODUCTS**

7 2.1 MATERIALS AND EQUIPMENT

- 8 A. Materials and equipment shall be as specified in individual Sections.

9 **PART 3 - EXECUTION**

10 3.1 EXAMINATION

11 A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF
 12 WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT
 13 THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND
 14 VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.

15 B. Where walls, ceilings, etc., are shown as being removed on general drawings, the
 16 Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts,
 17 systems, etc., from the removed area.

18 C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others,
 19 This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts,
 20 systems, etc.

21 D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend
 22 services to facilities or equipment that shall remain in operation following demolition.

23 E. Coordinate work with all other Contractors and the Owner. Schedule removal of
 24 equipment to avoid conflicts.

25 F. This Contractor shall verify all existing equipment sizes and capacities where equipment is
 26 scheduled to be replaced or modified, prior to ordering new equipment.

27 G. Bid submittal shall mean the Contractor has visited the project site and verified existing
 28 conditions and scope of work.

29 3.2 PREPARATION

30 A. Disconnect mechanical systems in walls, floors, and ceilings scheduled for removal.

31 B. Provide temporary connections to maintain existing systems in service during construction.
 32 When work must be performed on operating equipment, use personnel experienced in such
 33 operations.

34 C. Existing Heating System: Maintain existing system in service until new system is
 35 complete and ready for service. Drain system only to make switchovers and connections.
 36 Obtain permission from the Owner at least 48 hours before partially or completely draining
 37 system. Minimize outage duration.

- 1 3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK
- 2 A. Demolish and extend existing mechanical work under provisions of Division 2 and this
3 Section.
- 4 B. Remove, relocate, and extend existing installations to accommodate new construction.
- 5 C. Remove abandoned ducts and piping to source of supply and/or main lines.
- 6 D. Remove exposed abandoned pipes and ducts, including abandoned pipes and ducts above
7 accessible ceilings. Cut ducts flush with walls and floors, cap duct that remains, and patch
8 surfaces. Cut pipes above ceilings, below floors and behind walls. Cap remaining lines.
9 Repair building construction to match original. Remove all clamps, hangers, supports, etc.
10 associated with pipe and duct removal.
- 11 E. Disconnect and remove mechanical devices and equipment serving equipment that has
12 been removed.
- 13 F. Repair adjacent construction and finishes damaged during demolition and extension work.
- 14 G. Maintain access to existing mechanical installations which remain. Modify installation or
15 provide access panels as appropriate.
- 16 H. Remove unused sections of supply and return air ductwork back to mains. Patch opening
17 with sheet metal and seal airtight. Patch existing insulation to match existing. Where
18 existing ductwork is to be capped and reused, locate the end cap within 6" of the last
19 branch. End caps shall be 3" pressure class and seal class "A".
- 20 I. Extend existing installations using materials and methods compatible with existing
21 installations, or as specified.
- 22 3.4 CUTTING AND PATCHING
- 23 A. This Contractor is responsible for all penetrations of existing construction required to
24 complete the work of this project. Refer to Section 23 05 29 for additional requirements.
- 25 B. Penetrations in existing construction should be reviewed carefully prior to proceeding with
26 any work.
- 27 C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where
28 possible for clean opening.
- 29 D. Repair existing construction as required after penetration is complete to restore to original
30 condition. Use similar materials and match adjacent construction unless otherwise noted or
31 agreed to by the Architect/Engineer prior to start of work.
- 32 E. Floor slabs may contain conduit systems. This Contractor is responsible for taking any
33 measures required to ensure no conduits or other services are damaged. This includes x-
34 ray or similar non-destructive means.
- 35 F. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of
36 any cables, conduits, or other services if damaged without proper investigation.
- 37 3.5 CLEANING AND REPAIR
- 38 A. Clean and repair existing materials and equipment which remain or are to be reused.
- 39 B. Clean all systems adjacent to project which are affected by the dust and debris caused by
40 this construction.

1 C. MECHANICAL ITEMS REMOVED AND NOT RELOCATED REMAIN THE
2 PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED
3 BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE
4 CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT
5 TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

6 END OF SECTION

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1 **SECTION 23 05 13 - MOTORS**

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

4 A. Single Phase Electric Motors.

5 1.2 SUBMITTALS

6 A. Submit shop drawings under provisions of Section 23 05 00. Include nominal efficiency
7 and power factor for all premium efficiency motors. Efficiencies must meet or exceed the
8 nominal energy efficiency levels presented below.

9 B. Submit shop drawings for all three phase motors.

10 C. Submit motor data with equipment when motor is installed by the manufacturer at the
11 factory.

12 1.3 DELIVERY, STORAGE, AND HANDLING

13 A. Protect motors stored on site from weather and moisture by maintaining factory covers and
14 suitable weatherproof coverings. For extended outdoor storage, follow manufacturer's
15 recommendations for equipment and motor.

16 1.4 OPERATION AND MAINTENANCE DATA

17 A. Submit operation and maintenance data including assembly drawings, bearing data
18 including replacement sizes, and lubrication instructions.

19 1.5 QUALIFICATIONS

20 A. Manufacturer: Company specializing in the manufacture of commercial and industrial
21 motors and accessories, with a minimum of three years documented manufacturing
22 experience.

23 **PART 2 - PRODUCTS**

24 2.1 MOTORS - GENERAL CONSTRUCTION AND REQUIREMENTS

25 A. Refer to the drawings for required electrical characteristics.

26 B. Design motors for continuous operation in 40°C environment, and for temperature rise in
27 accordance with ANSI/NEMA MG 1 limits for insulation class, service factor, and motor
28 enclosure type.

29 C. Visible Nameplate: Indicating horsepower, voltage, phase, hertz, RPM, full load amps,
30 locked rotor amps, frame size, manufacturer's name and model number, service factor,
31 power factor, insulation class.

32 D. Electrical Connection: Boxes, threaded for conduit. For fractional horsepower motors
33 where connection is made directly, provide conduit connection in end frame.

34 E. Unless otherwise indicated, motors 3/4 HP and smaller shall be single phase, 60 hertz, open
35 drip-proof or totally enclosed fan-cooled type.

- 1 F. Unless otherwise indicated, motors 1 HP and larger shall be three phase, 60 hertz, squirrel
2 cage type, NEMA Design Code B (low current in-rush, normal starting torque), open drip-
3 proof or totally enclosed fan-cooled type.
- 4 G. Each contractor shall set all motors furnished by him.
- 5 H. All motors shall have a minimum service factor of 1.15.
- 6 I. All motors shall have ball or roller bearings with a minimum L-10 fatigue life of 150,000
7 hours in direct-coupled applications and 50,000 hours for belted applications. Belted rating
8 shall be based on radial loads and pulley sizes called out in NEMA MG1-14.43.
- 9 J. Bearings shall be sealed type for 10 HP and smaller motors.
- 10 K. Provide all belted motors with a means of moving and securing the motor to tighten belts.
- 11 L. Motors for fans and pumps 1/12 HP or greater and less than 1 HP shall be electronically-
12 commutated motors or shall have a minimum motor efficiency of 70% when rated in
13 accordance with DOE 10 CFR 431. These motors shall also have the means to adjust motor
14 speed for either balancing or remote control. Belt-driven fans may use sheave adjustments
15 for airflow balancing in lieu of varying motor speed.
- 16 2.2 SHEAVES
- 17 A. All sheaves shall conform to NEMA Standard MG1-14.42, which lists minimum diameters
18 and maximum overhangs. Locate motors to minimize overhang.
- 19 B. When replacing sheaves, use sheaves of at least the originally supplied sizes.
- 20 C. Contractor responsible for motor shall also be responsible for replacement sheaves.
21 Coordinate with testing and balancing of the equipment.

22 **PART 3 - EXECUTION**

23 3.1 INSTALLATION

- 24 A. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial
25 guards and/or guards that do not meet all applicable OSHA standards are not acceptable.
26 Contractor is responsible for providing this guarding if it is not provided with the
27 equipment supplied.
- 28 B. For belt drive motors, mount sheaves on the appropriate shafts per manufacturer's
29 instructions. Use a straight edge to check alignment of the sheaves. Reposition sheaves as
30 necessary so the straight edge contacts both sheave faces squarely. After sheaves are
31 aligned, loosen the adjustable motor base so the belt(s) can be added, and tighten the base
32 so the belt tension is in accordance with the drive manufacturer's recommendations.
33 Frequently check belt tension and adjust if necessary during the first day of operation and
34 again after 80 hours of operation.

35 END OF SECTION

1

SECTION 23 05 29 - HVAC SUPPORTS AND ANCHORS

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Hangers, Supports, and Associated Anchors.
- 5 B. Equipment Bases and Supports.
- 6 C. Sleeves and Seals.
- 7 D. Flashing and Sealing of Equipment and Pipe Stacks.
- 8 E. Cutting of Openings.
- 9 F. Escutcheon Plates and Trim.

10 1.2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- 11 A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

12 **PART 2 - PRODUCTS**

13 2.1 HANGER RODS

- 14 A. Hanger rods for single rod hangers shall conform to the following:

Pipe Size	Hanger Rod Diameter	
	Column #1	Column #2
2" and smaller	3/8"	3/8"
2-1/2" through 3-5/8"	1/2"	1/2"
4" and 5"	5/8"	1/2"

15 Column #1: Steel pipe.
 16 Column #2: Copper pipe.

- 17 B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8
 18 inches.
- 19 C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have
 20 ASTM B633 electro-plated zinc finish.

21 2.2 PIPE HANGERS AND SUPPORTS

- 22 A. All pipe hangers, clamps, and supports shall conform to Manufacturers Standardization
 23 Society MSS-SP-58 and 127 (where applicable).
- 24 B. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and
 25 jacket to pass through unbroken. This applies to both hot and cold pipes.
- 26 C. Ferrous hot piping 2-1/2 inches and larger shall have steel saddles tack welded to the pipe
 27 at each support at a depth not less than the specified insulation. Factory fabricated inserts
 28 may be used.

Acceptable Products:

- Anvil - Fig. 160, 161, 162, 163, 164, 165
- Cooper/B-Line - Fig. 3160, 3161, 3162, 3163, 3164, 3165
- Erico - Model 630, 631, 632, 633, 634, 635
- Nibco/Tolco - Fig. 260-1, 261-1 1/2, 262-2, 263-2 1/2, 264-3, 265-4

- 1 D. On all insulated piping, provide a semi-cylindrical metallic shield and fire resistant vapor
2 barrier jacket.
- 3 E. As an alternative to separate pipe insulation insert and saddle, properly sized integral rigid
4 insulation sections may be used for this application.

Acceptable Products:

Cooper/B-Line - Fig. B3380 through B3384
Pipe Shields - A1000, A2000
Erico - Model 124, 127

- 5 F. Support and laterally brace vertical pipes at every floor level in multi-story structures, and
6 more frequently when required by applicable codes (the Illinois Plumbing Code requires 10
7 foot maximum spacing for support of copper risers), but never at intervals over 15 feet.
8 Support vertical pipes with riser clamps installed below hubs, couplings or lugs. Provide
9 sufficient flexibility to accommodate expansion and contraction without compromising fire
10 barrier penetrations and other fixed take-off locations.

Acceptable Products:

Anvil - Fig. CT121
Cooper/B-Line - Fig. B3373CT
Erico - Model 510
Nibco/Tolco - Fig. 82

- 11 G. Place restrained neoprene mounts beneath vertical pipe riser clamps to prevent sweating of
12 cold pipes. Insulate over mounts.

13 Acceptable Products: Mason RBA, RCA, or BR.

- 14 H. Hangers in direct contact with copper pipe shall be coated with plastic with appropriate
15 temperature range. HYDRA-ZORB clamps are permitted for this application for bare
16 pipes within their temperature limits of -65°F to +275°F.

- 17 I. Unless otherwise indicated, hangers shall be as follows:

- 18 1. Clevis Type:
19 Service: Insulated Hot Pipe – 3 inches and Smaller

<u>Acceptable Products:</u>	<u>Insulated Pipe</u>
Anvil	Fig. 260
Cooper/B-Line	Fig. 3100
Erico	Model 400
Nibco/Tolco	Fig. 1

- 20 J. Support may be fabricated from U-Channel strut or similar shapes. Piping less than 4" in
21 diameter shall be secured to strut with clamps of proper design and capacity as required to
22 maintain spacing and alignment. Strut shall be independently supported from hanger drops
23 or building structure. Size and support shall be per manufacturer's installation
24 requirements for structural support of piping. Clamps shall not interrupt piping insulation.

- 25 1. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633
26 electro-plated zinc finish.

- 27 2. Strut used in damp areas listed in hanger rods shall have ASTM A123 hot-dip
28 galvanized finish applied after fabrication.

- 1 K. Unless otherwise indicated, pipe supports for use with struts shall be as follows:
- 2 1. Clamp Type:
- 3 Service: Insulated Hot Pipe – 3 inches and Smaller
- 4 a. Clamps in direct contact with copper pipe shall be plastic coated.
- 5 b. Pipes subject to expansion and contraction shall have clamps slightly
- 6 oversized to allow limited pipe movement.

<u>Acceptable Products:</u>	<u>Insulated Pipe</u>
Unistrut	Fig. P1100 or P2500
Cooper/B-Line	Fig. B2000 or B2400
Nibco/Tolco	Fig. A-14 or 2STR

- 7 L. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as
- 8 follows:

- 9 1. Beam Clamps:
- | <u>Acceptable Products:</u> | |
|-----------------------------|---------------|
| Anvil | Fig. 228, 292 |
| Cooper/B-Line | Fig. B3054 |
| Erico | Model 360 |
| Nibco/Tolco | Fig. 329 |
- 10 2. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors
- 11 designed per the requirements of Appendix D of ACI 318-05. Post-installed
- 12 anchors shall be qualified for use in cracked concrete by ACI-355.2.

- 13 M. Wall supports shall be used where vertical height of structure exceeds minimum spacing
- 14 requirements. Install wall supports at same spacing as hangers or strut supports along
- 15 vertical length of pipe runs.

- 16 N. Welding:
- 17 1. Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded
- 18 in lieu of bolting, clamping, or riveting to the building structural frame. Take
- 19 adequate precautions during all welding operations for fire prevention and for
- 20 protecting walls and ceilings from being damaged by smoke.

21 2.3 OPENINGS IN FLOORS, WALLS AND CEILINGS

- 22 A. Exact locations of all openings for the installation of materials shall be determined by the
- 23 Contractor and given to the General Contractor for installation or construction as the
- 24 structure is built.
- 25 B. Coordinate all openings with other Contractors.
- 26 C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in
- 27 or through existing structures, or openings in new structures that were not installed, or
- 28 additional openings. Repair all spalling and damage to the satisfaction of the
- 29 Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and
- 30 uniform opening edges.
- 31 D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate
- 32 openings with other Contractors shall not exempt the Contractor from providing openings
- 33 at his expense.

- 1 E. Do not cut structural members without written approval of the Architect or Structural
2 Engineer.
- 3 2.4 SLEEVES AND LINTELS
- 4 A. Each Contractor shall provide sleeves and lintels for all duct and pipe openings required for
5 the Contractor's work in masonry walls and floors, unless specifically shown as being by
6 others.
- 7 B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings.
8 Provide continuous sleeve. Cut or split sleeves are not acceptable.
- 9 C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the
10 drawings. Have all lintels approved by the Architect or Structural Engineer.
- 11 D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed
12 squared ends extending 1" above the floor in unfinished areas, and flush with the floor in
13 finished areas, to accept spring closing floor plates.
- 14 E. Sleeves shall not penetrate structural members or masonry walls without approval from the
15 Structural Engineer. Sleeves shall then comply with the Architect/Engineer's design.
- 16 F. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This
17 Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- 18 G. Size sleeves large enough to allow expansion and contraction movement. Provide
19 continuous insulation wrapping.
- 20 2.5 ESCUTCHEON PLATES AND TRIM
- 21 A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors,
22 or ceilings of finished rooms.
- 23 B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium
24 plated finish, heavy spring clip, rigid hinge and latch.
- 25 C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and
26 raw construction edges of all rectangular openings in finished rooms. This includes pipe
27 openings.
- 28 2.6 PIPE PENETRATIONS
- 29 A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk.
30 Backing material may be used.
- 31 B. Seal fire rated wall and floor penetrations with fire seal system as specified.
- 32 2.7 PIPE ANCHORS
- 33 A. Provide all items needed to allow adequate expansion and contraction of all piping. All
34 piping shall be supported, guided, aligned, and anchored as required.
- 35 B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the
36 building.
- 37 2.8 FINISH
- 38 A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe
39 shafts, and suspended ceiling spaces are not considered exposed.

1 **PART 3 - EXECUTION**

2 3.1 HVAC SUPPORTS AND ANCHORS

3 A. General Installation Requirements:

- 4 1. Install all items per manufacturer's instructions.
- 5 2. Coordinate the location and method of support of piping systems with all
6 installations under other Divisions and Sections of the Specifications.
- 7 3. Where pipe support members are welded to structural building framing, scrape,
8 brush clean, and apply one coat of zinc rich primer to welding.

9 B. Supports Requirements:

- 10 1. Install roof pipe supports to resist wind movement per manufacturer's
11 recommendations. Method of securing base to roof shall be compatible with
12 roofing materials.
- 13 2. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel,
14 etc., which attach to it shall be installed prior to application of fireproofing.
15 Repair all fireproofing damaged during pipe installation.
- 16 3. Set all concrete inserts in place before pouring concrete.
- 17 4. Furnish, install and prime all auxiliary structural steel for support of piping
18 systems that are not shown on the Drawings as being by others.
- 19 5. Install hangers and supports complete with lock nuts, clamps, rods, bolts,
20 couplings, swivels, inserts and required accessories.
- 21 6. Hangers for horizontal piping shall have adequate means of vertical adjustment
22 for alignment.

23 C. Pipe Requirements:

- 24 1. Support all piping and equipment, including valves, strainers, traps and other
25 specialties and accessories to avoid objectionable or excessive stress, deflection,
26 swaying, sagging or vibration in the piping or building structure during erection,
27 cleaning, testing and normal operation of the systems.
- 28 2. Do not, however, restrain piping to cause it to snake or buckle between supports
29 or to prevent proper movement due to expansion and contraction.
- 30 3. Support piping at equipment and valves so they can be disconnected and removed
31 without further supporting the piping.
- 32 4. Piping shall not introduce strains or distortion to connected equipment.
- 33 5. Parallel horizontal pipes may be supported on trapeze hangers made of structural
34 shapes and hanger rods; otherwise, pipes shall be supported with individual
35 hangers.
- 36 6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
- 37 7. Provide additional supports where pipe changes direction, adjacent to flanged
38 valves and strainers, at equipment connections and heavy fittings.
- 39 8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with
40 mechanical couplings.

- 1 D. Provided the installation complies with all loading requirements of truss and joist
2 manufacturers, the following practices are acceptable:
- 3 1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom
4 chords of trusses or joists with a minimum 3' spacing between loads.
- 5 2. Loads greater than 100 lbs. must be hung concentrically and may be hung from
6 top or bottom chord, provided one of the following conditions is met:
- 7 a. The hanger is attached within 6" from a web/chord joint.
- 8 b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's
9 requirements.
- 10 3. It is prohibited to cantilever a load using an angle or other structural component
11 that is attached to a truss or joist in such a fashion that a torsional force is applied
12 to that structural member.
- 13 4. If conditions cannot be met, coordinate installation with truss or joist
14 manufacturer and contact Architect/Engineer.
- 15 E. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when
16 attaching to metal roof decking (limitation not required with concrete on metal deck). This
17 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging
18 from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel
19 framing will need to be added.
- 20 F. Do not exceed the manufacturer's recommended maximum load for any hanger or support.
- 21 G. Spacing of Hangers shall not exceed the compressive strength of the insulation inserts, and
22 in no case shall exceed the following:

	<u>Pipe Material</u>	<u>Maximum Spacing</u>
1.	Steel and Fiberglass (Std. Weight or Heavier – Liquid Service):	
	1-1/4" & under	7'-0"
	1-1/2"	9'-0"
	2"	10'-0"
	2-1/2"	11'-0"
	3"	12'-0"
	4" & larger	12'-0"
2.	Hard Drawn Copper & Brass (Liquid Service):	
	3/4" and under	5'-0"
	1"	6'-0"
	1-1/4"	7'-0"
	1-1/2"	8'-0"
	2"	8'-0"
	2-1/2"	9'-0"
	3"	10'-0"
	4"	12'-0"
3.	Installation of hangers shall conform to MSS SP-58 and the applicable Mechanical Code.	

25 END OF SECTION

1

SECTION 23 05 53 - HVAC IDENTIFICATION

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

4 A. Identification of products installed under Division 23.

5 **PART 2 - PRODUCTS**

6 2.1 ACCEPTABLE MANUFACTURERS

7 A. 3M, Bunting, Calpico, Craftmark, Emedco, Kolbi Industries, Seton, W.H. Brady, Marking
8 Services.

9 2.2 MATERIALS

10 A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths
11 and letter sizes shall be at least the following:

<u>O.D. of Pipe or insulation</u>	<u>Marker Length</u>	<u>Size of Letters</u>
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"

12 Plastic tags may be used for outside diameters under 3/4".

13 B. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum
14 letters on light contrasting background.

15 C. Aluminum Nameplates: Black enamel background with natural aluminum border and
16 engraved letters furnished with two mounting holes and screws.

17 D. Plastic Tags: Minimum 1-1/2" square or round laminated three-layer phenolic with
18 engraved, 1/4" minimum black letters on light contrasting background.

19 E. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2"
20 square or 1-1/2" round.

21 F. Stencil Painted Pipe Markers: Use industrial enamel spray paint per ANSI Standard A13.1.
22 Indicate fluid conveyed and flow direction.

23 **PART 3 - EXECUTION**

24 3.1 INSTALLATION

25 A. Install all products per manufacturer's recommendations.

26 B. Degrease and clean surfaces to receive adhesive for identification materials.

27 C. Pipe Markers:

28 1. Stencil Painted Pipe Markers:

29 a. Remove rust, grease, dirt, and all foreign substances from the pipe
30 surface.

1

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Testing, adjusting, and balancing of air systems.

5

B. Testing, adjusting, and balancing of heating systems.

6

C. Measurement of final operating condition of HVAC systems.

7

1.2 QUALITY ASSURANCE

8

A. Agency shall be a company specializing in the adjusting and balancing of systems specified in this section with minimum three years' experience. Perform work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, SMARTA Certified Air and Hydronic Balancer, or TABB Certified Supervisor.

9

10

11

12

13

B. Work shall be performed in accordance with the requirements of the references listed at the start of this section.

14

15

1.3 REFERENCES

16

A. AABC - National Standards for Total System Balance, 2002.

17

B. ADC – Test Code for Grilles, Registers, and Diffusers.

18

C. AMCA – Publication 203-90; Field Performance Measurement of Fan Systems.

19

D. ASHRAE - 2003 HVAC Applications Handbook; Chapter 37, Testing, Adjusting and Balancing.

20

21

E. ASHRAE/ANSI - Standard 111-1988; Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC&R Systems.

22

23

F. NEBB - Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems, Sixth Edition, 1998.

24

25

G. SMACNA - HVAC Systems; Testing, Adjusting and Balancing, Third Edition, 2002.

26

H. TABB – International Standards for Environmental Systems Balance.

27

1.4 SUBMITTALS

28

A. Submit copies of report forms, balancing procedures, and the name and qualifications of testing and balancing agency for approval within 30 days after award of Contract.

29

30

B. Submit four (4) certified copies of test reports to the Architect/Engineer for approval in soft cover, 3-hole binder manuals, with cover identification. Include index page and indexing tabs.

31

32

33

1.5 REPORT FORMS

34

A. Submit reports on AABC, SMACNA or NEBB forms. Use custom forms approved by the Architect/Engineer when needed to supply specified information.

35

1 B. Include in the final report a schematic drawing showing each system component, including
2 balancing devices, for each system. Each drawing shall be included with the test reports
3 required for that system. The schematic drawings shall identify all testing points and cross-
4 reference these points to the report forms and procedures.

5 C. Refer to PART 4 for required reports.

6 1.6 WARRANTY/GUARANTEE

7 A. The TAB Contractor shall include an extended warranty of 90 days after owner receipt of a
8 completed balancing report, during which time the Owner may request a recheck of
9 terminals, or resetting of any outlet, coil, or device listed in the test report. This warranty
10 shall provide a minimum of 24 man-hours of onsite service time. If it is determined that
11 the new test results are not within the design criteria, the balancer shall rebalance the
12 system according to design criteria.

13 B. Warranty/Guarantee must meet one of the following programs: TABB International
14 Quality Assurance Program, AABC National Project Performance Guarantee, NEBB's
15 Conformance Certification.

16 1.7 SCHEDULING

17 A. Coordinate schedule with other trades. Provide a minimum of seven days' notice to all
18 trades and the Architect/Engineer prior to performing each test.

19 **PART 2 - PRODUCTS**

20 NOT APPLICABLE

21 **PART 3 - EXECUTION**

22 3.1 GENERAL REQUIREMENTS

23 A. All procedures must conform to a published standard listed in the References article of this
24 section. All equipment shall be adjusted in accordance with the manufacturer's
25 recommendations. Any system not listed in this specification but installed under the
26 contract documents shall be balanced using a procedure from a published standard listed in
27 the References article.

28 B. Recorded data shall represent actual measured or observed conditions.

29 C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the
30 minimum extent necessary to allow adequate performance of procedures. After testing and
31 balancing is complete, close probe holes and patch insulation with new materials as
32 specified. Restore vapor barrier and finish as specified.

33 D. Permanently mark setting of valves, dampers, and other adjustment devices allowing for
34 settings to be restored. Set and lock memory stops.

35 E. Leave systems in proper working order, replacing belt guards, closing access doors, closing
36 doors to electrical switch boxes, plugging test holes, and restoring thermostats to specified
37 settings.

38 F. The Balancing Contractor shall measure terminal air box air flow, and the TCC shall adjust
39 DDC readout to match. Refer to Section 23 09 00 for additional information.

- 1 G. Installations with systems consisting of multiple components shall be balanced with all
2 system components operating.
- 3 3.2 EXAMINATION
- 4 A. Before beginning work, verify that systems are complete and operable. Ensure the
5 following:
- 6 1. General Equipment Requirements:
- 7 a. Equipment is safe to operate and in normal condition.
8 b. Equipment with moving parts is properly lubricated.
9 c. Temperature control systems are complete and operable.
10 d. Proper thermal overload protection is in place for electrical equipment.
11 e. Direction of rotation of all fans and pumps is correct.
12 f. Access doors are closed and end caps are in place.
- 13 2. Duct System Requirements:
- 14 a. All filters are clean and in place. If required, install temporary media.
15 b. Duct systems are clean and free of debris.
16 c. Fire/smoke and manual volume dampers are in place, functional and
17 open.
18 d. Air outlets are installed and connected.
19 e. Duct system leakage has been minimized.
- 20 3. Pipe System Requirements:
- 21 a. Coil fins have been cleaned and combed.
22 b. Hydronic systems have been cleaned, filled, and vented.
23 c. Strainer screens are clean and in place.
24 d. Shutoff, throttling and balancing valves are open.
- 25 B. Report any defects or deficiencies to Architect/Engineer.
- 26 C. Promptly report items that are abnormal or prevent proper balancing.
- 27 D. If, for design reasons, system cannot be properly balanced, report as soon as observed.
- 28 E. Beginning of work means acceptance of existing conditions.
- 29 3.3 PREPARATION
- 30 A. Provide instruments required for testing, adjusting, and balancing operations. Make
31 instruments available to the Architect/Engineer for spot checks during testing.
- 32 B. Instruments shall be calibrated within six months of testing performed for project, or more
33 recently if recommended by the instrument manufacturer.
- 34 3.4 INSTALLATION TOLERANCES
- 35 A. $\pm 10\%$ of scheduled values:
- 36 1. Adjust air inlets and outlets to $\pm 10\%$ of scheduled values.
- 37 2. Adjust piping systems to $\pm 10\%$ of design values.

1 3.5 ADJUSTING

- 2 A. After adjustment, take measurements to verify balance has not been disrupted or that
3 disruption has been rectified.
- 4 B. Once balancing of systems is complete, at least one damper or valve must be 100% open.
- 5 C. After testing, adjusting and balancing are complete, operate each system and randomly
6 check measurements to verify system is operating as reported in the report. Document any
7 discrepancies.
- 8 D. Contractor responsible for each motor shall also be responsible for replacement sheaves.
9 Coordinate with contractor.

10 3.6 SUBMISSION OF REPORTS

- 11 A. Fill in test results on appropriate forms.

12 **PART 4 - SYSTEMS TO BE TESTED, ADJUSTED AND BALANCED**

13 4.1 GENERAL REQUIREMENTS

- 14 A. Title Page:
- 15 1. Project name.
16 2. Project location.
17 3. Project Architect.
18 4. Project Engineer (KJWW Engineering Consultants).
19 5. Project General Contractor.
20 6. TAB Company name, address, phone number.
21 7. TAB Supervisor's name and certification number.
22 8. TAB Supervisor's signature and date.
23 9. Report date.
- 24 B. Report Index
- 25 C. General Information:
- 26 1. Test conditions.
27 2. Nomenclature used throughout report.
28 3. Notable system characteristics/discrepancies from design.
29 4. Test standards followed.
30 5. Any deficiencies noted.
31 6. Quality assurance statement.
- 32 D. Instrument List:
- 33 1. Instrument.
34 2. Manufacturer, model, and serial number.
35 3. Range.
36 4. Calibration date.

37 4.2 AIR SYSTEMS

- 38 A. Air Moving Equipment:
- 39 1. General Requirements:
40 a. Drawing symbol.

- 1 b. Location.
- 2 c. Manufacturer, model, arrangement, class, discharge.
- 3 d. Fan RPM.
- 4 e. Multiple RPM fan curve with operating point marked. (Obtain from
- 5 equipment supplier).
- 6 f. Final frequency of motor at maximum flow rate (on fans driven by
- 7 VFD).
- 8 2. Flow Rate:
- 9 a. Supply flow rate (cfm): specified and actual.
- 10 b. Return flow rate (cfm): specified and actual.
- 11 c. Outside flow rate (cfm): specified and actual.
- 12 d. Exhaust flow rate (cfm): specified and actual.
- 13 3. Pressure Drop and Pressure:
- 14 a. Filter pressure drop: specified and actual.
- 15 b. Total static pressure: specified and actual. (Indicate if across fan or
- 16 external to unit).
- 17 c. Inlet pressure.
- 18 d. Discharge pressure.

19 B. Fan Data:

- 20 1. Drawing symbol.
- 21 2. Location.
- 22 3. Manufacturer and model.
- 23 4. Flow rate (cfm): specified and actual.
- 24 5. Total static pressure: specified and actual. (Indicate measurement locations).
- 25 6. Inlet pressure.
- 26 7. Discharge pressure.
- 27 8. Fan RPM.

28 C. Electric Motors:

- 29 1. Drawing symbol of equipment served.
- 30 2. Manufacturer, Model, Frame.
- 31 3. Nameplate: HP, phase, service factor, RPM, operating amps, efficiency.
- 32 4. Measured: Amps in each phase.

33 D. Air Terminal (Inlet or Outlet):

- 34 1. Drawing symbol.
- 35 2. Room number/location.
- 36 3. Terminal type and size.
- 37 4. Velocity: specified and actual.
- 38 5. Flow rate (cfm): specified and actual.
- 39 6. Percent of design flow rate.

40 4.3 HEATING SYSTEMS

41 A. Pump Data (Primary and Secondary Heating water Loop Pumps):

- 42 1. Existing drawing symbol or equipment TAG
- 43 2. Service.
- 44 3. Manufacturer, size, and model.
- 45 4. Impeller size: specified, actual, and final (if trimmed).
- 46 5. Flow Rate (gpm): specified and actual.
- 47 6. Pump Head: specified, operating and shutoff.
- 48 7. Suction Pressure: Operating and shutoff.
- 49 8. Discharge Pressure: Operating and shutoff.
- 50 9. Final frequency of motor at maximum flow rate (on pumps driven by VFD).

- 1 B. Electric Motors (Associated Heating Water Loop Pump Motors):
- 2 1. Drawing symbol of equipment served.
- 3 2. Manufacturer, Model, Frame.
- 4 3. Nameplate: HP, phase, service factor, RPM, operating amps, efficiency.
- 5 4. Measured: Amps in each phase.
- 6 C. Terminal Heat Transfer Units:
- 7 1. General Requirement:
- 8 a. Drawing symbol.
- 9 b. Location.
- 10 c. Manufacturer and model.
- 11 d. Include air data only for forced air units.
- 12 2. Flow Rate:
- 13 a. Flow rate (cfm): specified and actual.
- 14 b. Water flow rate (gpm): specified and actual.
- 15 3. Temperature:
- 16 a. Entering air temperature: specified and actual.
- 17 b. Leaving air temperature: specified and actual.
- 18 c. Entering water temperature: specified and actual.
- 19 d. Leaving water temperature: specified and actual.
- 20 4. Energy:
- 21 a. Air Btuh (cfm x temperature rise x 1.09).
- 22 b. Water Btuh (gpm x temperature drop x 500). Repeat tests if not within
- 23 10% of air Btuh.

24

END OF SECTION

1

SECTION 23 07 13 - DUCTWORK INSULATION

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Ductwork Insulation.
- 5 B. Insulation Jackets.

6 1.2 QUALITY ASSURANCE

- 7 A. Applicator: Company specializing in ductwork insulation application with five years
8 minimum experience. When requested, installer shall submit manufacturer's certificate
9 indicating qualifications.
- 10 B. Materials: UL listed in Category HNKT; flame spread/smoke developed rating of 25/50 in
11 accordance with ASTM E84, NFPA 255, or UL 723.
- 12 C. Adhesives: UL listed, meeting NFPA 90A/90B requirements.

13 **PART 2 - PRODUCTS**

14 2.1 MATERIALS

- 15 A. Type A: Flexible Fiberglass - Outside Wrap; ANSI/ASTM C553; commercial grade; 0.28
16 maximum 'K' value at 75°F; foil scrim kraft facing, 1.0 lb./cu. ft. density.

17 2.2 JACKETS

- 18 A. Vapor Barrier Jackets: Kraft reinforced foil scrim vapor barrier with self-sealing adhesive
19 joints. Beach puncture resistance ratio of at least 25 units. Tensile strength: 35 psi
20 minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

21 **PART 3 - EXECUTION**

22 3.1 INSTALLATION

- 23 A. Install materials in accordance with manufacturer's instructions, codes, and industry
24 standards.
- 25 B. Install materials after ductwork has been tested.
- 26 C. Clean surfaces for adhesives.
- 27 D. Provide insulation with vapor barrier when air conveyed may be below ambient
28 temperature.
- 29 E. Exterior Duct Wrap - Flexible, Type A:
 - 30 1. Apply with edges tightly butted.
 - 31 2. Cut slightly longer than perimeter of duct to insure full thickness at corners. Do
32 not wrap excessively tight.
 - 33 3. Seal joints with adhesive backed tape.

1

SECTION 23 07 19 - HVAC PIPING INSULATION

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Piping Insulation.
- 5 B. Insulation Jackets.

6 1.2 QUALITY ASSURANCE

- 7 A. Applicator: Company specializing in piping insulation application with five years
8 minimum experience.
- 9 B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84,
10 NFPA 255, or UL 723 (where required).

11 1.3 SUBMITTALS

- 12 A. Submit shop drawings per Section 23 05 00. Include product description, list of materials
13 and thickness for each service, and locations.

14 **PART 2 - PRODUCTS**

15 2.1 INSULATION

- 16 A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75°F; non-
17 combustible. All purpose, white kraft jacket bonded to aluminum foil and reinforced with
18 fiberglass yarn, 25/50 flame spread/smoke developed rating when tested in accordance with
19 ASTM E84 (UL 723).

20 2.2 VAPOR BARRIER JACKETS

- 21 A. Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Beach puncture
22 resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal
23 acrylic adhesive on longitudinal jacket laps and butt strips.
- 24 B. Polyvinylidene Chloride (PVDC or Saran) film and tape: Durable and highly moisture and
25 moisture vapor resistant. Please refer to manufacturer's recommended installation
26 guidelines.

27 **PART 3 - EXECUTION**

28 3.1 PREPARATION

- 29 A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust
30 before applying insulation.

31 3.2 INSTALLATION

- 32 A. General Installation Requirements:

- 33 1. Install materials per manufacturer's instructions, building codes and industry
34 standards.

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2. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.
 3. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a 180° cylindrical segment the same length as metal shields. Inserts shall be a cellular glass (for all temperature ranges) or molded hydrous calcium silicate (for pipe with operating temperatures above 70°F, with a minimum compressive strength of 50 psi. Polyisocyanurate insulation with a minimum compressive strength of 24 psi is acceptable for pipe sizes 3" and below, minimum 60 psi for pipe sizes 4", and operate below 300°F. Factory fabricated inserts may be used. Rectangular blocks, plugs, or wood material are not acceptable. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor.
 4. Neatly finish insulation at supports, protrusions, and interruptions.
 5. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.
 6. Shields shall be at least the following lengths and gauges:

	Pipe Size	Shield Size
a.	1/2" to 3"	12" long x 18 gauge
b.	4"	12" long x 16 gauge
c.	5" to 6"	18" long x 16 gauge
d.	8" to 14"	24" long x 14 gauge
e.	16" to 24"	24" long x 12 gauge
 7. All piping and insulation that does not meet 25/50 that is located in an air plenum shall have written approval from the Authority Having Jurisdiction and the local fire department for authorization and materials approval. If approval has been allowed, the non-rated material shall be wrapped with a product that has passed ASTM E84 and/or NFPA 255 testing with a rating of 25/50 or below.
- B. Insulated Piping Operating Below 60°F:
1. Insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
- C. Insulated Piping Operating Between 60°F and 140°F:
1. Do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.
- D. Insulated Piping Operating Above 140°F:
1. Insulate fittings, valves, flanges, and strainers.
 2. All balance valves with fluid operating above 140°F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.
- E. Exposed Piping:
1. Locate and cover seams in least visible locations.

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SECTION 23 09 00 – CONTROLS

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1 **PART 1 - GENERAL**

2 1.1 SECTION INCLUDES

- 3 A. Complete System of Automatic Controls.
- 4 B. Control Devices, Components, Wiring and Material.
- 5 C. Instructions for Owners.
- 6 D. Remodeling.

7 1.2 SUBMITTALS

8 A. Equipment Coordination:

- 9 1. The Controls Contractor shall obtain approved equipment submittals from other
10 contractors to determine equipment wiring connections, to choose appropriate
11 controllers, and to provide programming.
- 12 2. Control valve selections shall be based on flow rates shown in approved shop
13 drawings.
- 14 3. Coordinate the control interface of all equipment with the equipment
15 manufacturers prior to submittal submission.

16 B. Shop Drawings:

- 17 1. Submit shop drawings per Section 23 05 00. In addition, submit an electronic
18 copy of the shop drawings in Adobe Acrobat (.pdf) format to the Owner for
19 review.
- 20 2. Sequences: Submit a complete description of the operation of the control system,
21 including sequences of operation. The description shall include and reference a
22 schematic diagram of the controlled system. **The wording of the control
23 sequences in the submittal shall match verbatim that included in the
24 construction documents to ensure there are no sequence deviations from that
25 intended by the Architect/Engineer. Clearly highlight any deviations from the
26 specified sequences on the submittals.**
- 27 3. Damper Schedule: Schedule shall include a separate line for each damper and a
28 column for each of the damper attributes:
 - 29 a. Damper Identification Tag.
 - 30 b. Location.
 - 31 c. Damper Type.
 - 32 d. Damper Size.
 - 33 e. Duct Size.
 - 34 f. Arrangement.
 - 35 g. Blade Type.
 - 36 h. Velocity.
 - 37 i. Pressure Drop.
 - 38 j. Fail Position.
 - 39 k. Actuator Identification Tag.
 - 40 l. Actuator Type.
 - 41 m. Mounting.
- 42 4. Valve Schedule: Valve manufacturer shall size valves and create a valve
43 schedule. Schedule shall include a separate line for each valve and a column for
44 each of the valve attributes:

- 1 a. Valve Identification Tag.
 - 2 b. Location.
 - 3 c. Valve Type.
 - 4 d. Valve Size.
 - 5 e. Pipe Size.
 - 6 f. Configuration.
 - 7 g. Flow Characteristics.
 - 8 h. Capacity.
 - 9 i. Valve Cv.
 - 10 j. Design Pressure Drop.
 - 11 k. Pressure Drop at Design Flow.
 - 12 l. Fail Position.
 - 13 m. Close-off Pressure.
 - 14 n. Valve and Actuator Model Number and Type.
- 15 5. Product Data Sheets: Required for each component that includes: unique
16 identification tag that is consistent throughout the submittal, manufacturer's
17 description, technical data, performance curves, installation/maintenance
18 instructions, and other relevant items. When manufacturer's literature applies to a
19 product series rather than a specific product, the data specifically applicable to the
20 project shall be highlighted or clearly indicated by other means. Each submitted
21 piece of literature and drawings shall clearly reference the specification and/or
22 drawing that the submittal is to cover. General catalogs shall not be accepted as
23 cutsheets to fulfill submittal requirements.
- 24 6. Quantities of items submitted may be reviewed but are the responsibility of the
25 Contractor to verify.
- 26 1.3 DELIVERY, STORAGE AND HANDLING
- 27 A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain
28 cartons through shipping, storage, and handling as required to prevent equipment damage.
29 Store equipment and materials inside and protected from weather.
- 30 B. Factory-Mounted Components: Where control devices specified in this section are
31 indicated to be factory mounted on equipment, arrange for shipping control devices to unit
32 manufacturer.
- 33 1.4 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
- 34 A. Control Valves.
- 35 B. Flow Switches.
- 36 C. Temperature Sensor Sockets.
- 37 D. Gauge Taps.
- 38 E. Automatic Dampers.
- 39 F. Flow Meters.
- 40 1.5 AGENCY AND CODE APPROVALS
- 41 A. All products shall have the following agency approvals. Provide verification that the
42 approvals exist for all submitted products with the submittal package.
- 43 1. UL-916; Energy Management Systems.
- 44 2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "Signal
45 Equipment."
- 46 3. EMC Directive 89/336/EEC (European CE Mark).
- 47 4. FCC, Part 15, Subpart J, Class A Computing Devices.

1 1.6 ACRONYMS

2 A. Acronyms used in this specification are as follows:

1. B-AAC BACnet Advanced Application Controller
2. B-ASC BACnet Application Specific Controller
3. BTL BACnet Testing Laboratories
4. DDC Direct Digital Controls
5. FMCS Facility Management and Control System
6. GUI Graphic User Interface
7. IBC Interoperable BACnet Controller
8. IDC Interoperable Digital Controller
9. LAN Local Area Network
10. NAC Network Area Controller
11. ODBC Open DataBase Connectivity
12. OOT Object Oriented Technology
13. OPC Open Connectivity via Open Standards
14. PICS Product Interoperability Compliance Statement
15. PMI Power Measurement Interface
16. POT Portable Operator's Terminal
17. TCC Temperature Control Contractor
18. TCS Temperature Control System
19. WAN Wide Area Network
20. WBI Web Browser Interface

3 1.7 SUMMARY

4 A. Provide new standalone thermostats as noted on mechanical plans.

5 1.8 JOB CONDITIONS

6 A. Cooperation with Other Trades: Coordinate the Work of this section with that of other
7 sections to ensure that the Work will be carried out in an orderly fashion. It is this
8 Contractor's responsibility to check the Contract Documents for possible conflicts between
9 the Work of this section and that of other crafts in equipment location; pipe, duct and
10 conduit runs; electrical outlets and fixtures; air diffusers; and structural and architectural
11 features.

12 1.9 WARRANTY

13 A. Refer to Section 23 05 00 for warranty requirements.

14 B. Within the warranty period, any defects in the work provided under this section due to
15 faulty materials, methods of installation or workmanship shall be promptly (within 48
16 hours after receipt of notice) repaired or replaced by this Contractor at no expense to the
17 Owner.

18 C. Warranty requirements include furnishing and installing all FMCS software upgrades
19 issued by the manufacturer during the one-year warranty period.

20 D. Update all software and back-ups during warranty period and all user documentation on the
21 Owner's archived software disks.

22 1.10 WARRANTY ACCESS

23 A. The Owner shall grant to this Contractor reasonable access to the TCS and FMCS during
24 the warranty period.

1 **PART 2 - PRODUCTS**

2 2.1 CONTROL DAMPERS

3 A. Thermally Insulated Control Damper:

- 4 1. Shall be licensed to bear the AMCA Certified Rating Seal.
- 5 2. Test leakage and pressure drop per AMCA 500.
- 6 3. Frame: Extruded aluminum, minimum 4" deep, 0.080" minimum thickness.
7 Frame shall be insulated with Styrofoam on three sides if installed in duct and four
8 sides if flanged to duct.
- 9 4. Blades: Minimum 12 gauge extruded aluminum airfoil design, minimum 6" wide,
10 internally insulated with expanded polyurethane foam and thermally broken, with
11 overlapping blades and blade seals (overlapping blade seals only is unacceptable).
- 12 5. Shaft: Non-cylindrical, solid aluminum shaft with opening in blade to match
13 profile of shaft. Shaft shall be securely fastened to the blade and of sufficient
14 length to mount direct-coupled actuator. Damper manufacturer shall provide
15 drive pin extensions and outboard bearing support brackets as required.
- 16 6. Bearings: Acetal (Delrin/Celcon) inner bearing fixed to an aluminum shaft,
17 rotating within a polycarbonate outer bearing inserted in the frame. Provide thrust
18 bearings for vertical damper applications.
- 19 7. Side Seals: Stainless steel compression type or extruded silicone gasket secured
20 in an integral slot within the frame.
- 21 8. Linkage: Shall be concealed in the frame, constructed of aluminum or corrosion-
22 resistant zinc plated steel, and securely fastened to shaft. Blades linked for
23 opposed operation, unless noted otherwise on the drawings. Blades shall close
24 evenly. Use one direct-coupled actuator per damper section. Jack-shafting is not
25 acceptable.
- 26 9. Size Limits: 48" maximum horizontal blade length, 24 square foot maximum area
27 per damper. Total cross-sectional area of dampers in ducts shall be at least as
28 large as the duct without the use of blank-off sections.
- 29 10. Maximum Leakage: 15 cfm at 1" w.c. pressure differential for a 24"x24" damper.
- 30 11. Maximum Pressure Drop: 0.21" for 8,000 cfm through a 24"x24" damper
31 (2000 fpm).

32 2.2 DAMPER ACTUATORS

33 A. Damper Actuators - Electronic - Spring Return:

- 34 1. Damper actuators shall be UL listed, electronic direct coupled with spring return
35 to normal position for modulating or two-position control as noted in the sequence
36 of control. Actuator shall be 24 VAC with proportional control, electronic
37 overload protection to prevent actuator damage due to over-rotation and "V" bolt
38 clamp with matching "V" toothed cradle (single bolt or setscrew fasteners not
39 acceptable).

- 1 2. Following power interruption, spring return mechanism shall close the damper.
2 Mechanical spring shall be rated for a minimum of 60,000 full cycles. Provide
3 breathable membrane in actuator housing to compensate for pressure differential
4 and allow for 95% non-condensing relative humidity in the airstream.
- 5 3. Mount actuators with motor outside of airstream whenever possible. Unit casings
6 shall have housing with proper weather, corrosive, or explosion-proof
7 construction as required by application.
- 8 4. Actuators shall be rated for 60,000 full cycles at rated torque with 2-year
9 unconditional warranty. Size actuators per damper manufacturer's
10 recommendations.
- 11 5. Provide end switches as required for the sequence of operation.
- 12 6. Provide analog feedback signal for positive position indication. Refer to FMCS
13 points list.

14 2.3 HYDRONIC CONTROL VALVES

15 A. General:

- 16 1. Two-position valves shall be a minimum of line size with a maximum allowable
17 pressure drop of 2 psi.
- 18 2. Size two-way and three-way modulating valves to provide a pressure drop at full
19 flow of 1 to 4 psi, except boiler three-way and cooling tower bypass valves shall
20 not have a pressure drop over 2 psi.
- 21 3. Two-way valves shall be 100% tight-closing. Three-way valves shall be 100%
22 tight-closing in both extreme positions.
- 23 4. Modulating two-way valves shall have equal percentage flow characteristics.
- 24 5. Modulating three-way valves shall have linear flow characteristics.
- 25 6. Piping geometry correction factors for C_v ratings shall be used and stated for ball
26 valves, butterfly valves, or non-characterized valves.

27 B. Two-position:

- 28 1. Ball 2" and under:
 - 29 a. Design Pressure: 400 psi
30 Design Temperature: 212°F
31 Design Flow Differential Pressure Rating: 150 psi
 - 32 b. Bronze or brass body, stainless steel stem, chrome plated brass or
33 stainless steel full port ball, PTFE or RTFE seats and seals, screwed ends
34 (solder ends are acceptable only if rated for soldering in line with 470°F
35 melting point of 95-5 solder).

- 1 C. Modulating:
- 2 1. Globe 1/2" to 2":
- 3 a. Design Pressure: 250 psi
- 4 Design Temperature: 212°F
- 5 Design Flow Differential Pressure Rating: 35 psi
- 6 b. Bronze or brass body, trim and plug; stainless steel stem; stainless steel
- 7 or bronze seat; EPDM or PTFE packing; threaded ends.
- 8 2. Ball 2" and under:
- 9 a. Design Pressure: 400 psi
- 10 Design Temperature: 212°F
- 11 Design Flow Differential Pressure Rating: 35 psi
- 12 b. Bronze or brass body, stainless steel stem, chrome plated brass or
- 13 stainless steel full port ball, PTFE or RTFE seats and seals, screwed ends
- 14 (solder ends are acceptable only if rated for soldering in line with 470°F
- 15 melting point of 95-5 solder).

16 2.4 VALVE ACTUATORS

17 A. General:

- 18 1. Actuators shall be sized to operate the valve through its full range of motion and
- 19 shall close against pump shutoff pressure without producing audible noise at any
- 20 valve position.
- 21 2. Provide visual position indication.
- 22 3. Mount actuator directly on valve or provide linear motion assembly as required
- 23 for valve type.

24 B. Valve Actuators - Electronic:

- 25 1. Actuator shall be UL listed and provided with NEMA housing for applicable
- 26 environment, electronic overload protection to prevent actuator damage due to
- 27 over-rotation, and "V" bolt clamp with matching "V" toothed cradle (single bolt
- 28 or setscrew fasteners not acceptable).
- 29 2. Actuators shall be rated for 60,000 full stroke cycles at rated torque. Stall motor
- 30 not acceptable.
- 31 3. Tri-state/floating actuators shall have auto-zeroing function for realigning valve
- 32 position.
- 33 4. Proportional actuator position shall be proportional to analog or pulse width
- 34 modulating signal from electronic control system.
- 35 5. Spring return actuators shall have an internal spring return mechanism. Non-
- 36 mechanical forms of fail-safe operation are not acceptable.
- 37 6. Provide analog feedback signal for positive position indication as required by
- 38 control diagrams.

1 2.5 CONTROL INSTRUMENTATION

2 A. Temperature Measuring Devices:

3 1. Electric Thermostats:

4 a. Single Temperature - Line Voltage Electric: Integral manual
5 ON/OFF/AUTO selector switch, minimum dead band of 5°F, concealed
6 temperature adjustment, locking cover, rated for load, single or double
7 pole as required.

8 b. Single Temperature - Low Voltage Electric: Integral manual
9 ON/OFF/AUTO selector switch, minimum dead band of 5°F, anticipator
10 circuits, concealed temperature adjustment, locking cover, 24 V control
11 transformer (if not included with unit under control), single or double
12 pole as required.

13 B. Miscellaneous Devices:

14 1. Control Relays:

15 a. Form "C" contacts rated for the application with "push-to-test" contact
16 transfer feature and an integral LED to indicate coil energization.

17 b. Mount all relays and power supplies in a NEMA 1 NEMA 12 enclosure
18 beside the FMCS panel or controlled device and clearly label their
19 functions.

20 2. Thermostat and Sensor Enclosures:

21 a. Clear plastic guard with lock. Wire guard with tamperproof screws.
22 Setpoint shall be adjustable with cover in place. Fasten to wall separately
23 from thermostat. Provide guards in all corridors, gymnasiums, locker
24 rooms, toilet rooms, assembly halls and as noted on the drawings.

25 2.6 CONDUIT

26 A. Conduit and Fittings: Refer to Electrical Section 26 05 33 for materials and sizing.

27 2.7 WIRE AND CABLE

28 A. Wire and Cable Materials: Refer to Electrical Section 26 05 13 for wire and cable
29 materials.

30 **PART 3 - EXECUTION**

31 3.1 GENERAL INSTALLATION

32 A. Verify that systems are ready to receive work. Beginning of installation means installer
33 accepts existing conditions.

34 B. Install system and materials in accordance with manufacturer's instructions.

35 C. Drawings of the TCS and FMCS network are diagrammatic only. Any apparatus not shown
36 but required to meet the intent of the project documents shall be furnished and installed
37 without additional cost.

- 1 D. Install all operators, sensors, and control devices where accessible for service, adjustment,
2 calibration, and repair. Do not install devices where blocked by piping or ductwork.
3 Devices with manual reset or limit adjustments shall be installed below 6'-0" if practical to
4 allow inspection without using a ladder.
- 5 E. Verify locations of wall-mounted devices (such as thermostats, temperature and humidity
6 sensors, and other exposed sensors) with drawings and room details before installation.
7 Coordinate mounting heights to be consistent with other wall-mounted devices. Maximum
8 height above finished floor shall not exceed 48". In accordance with the requirements of
9 LEED EQc1: Outdoor Air Delivery Monitoring, install all wall-mounted CO2 sensors
10 between 3 feet and 6 feet above the floor.
- 11 F. Provide valves over 3/4" size with position indicators and pilot positioners where
12 sequenced with other controls.
- 13 G. Mount control panels adjacent to associated equipment on vibration-free walls or
14 freestanding angle iron supports. One cabinet may accommodate more than one system in
15 same equipment room.
- 16 H. After completion of installation, test and adjust control equipment.
- 17 I. Check calibration of instruments. Recalibrate or replace.
- 18 J. Furnish and install conduit, wire, and cable per the National Electric Code, unless noted
19 otherwise in this section.
- 20 K. All controls associated with the proper operation of air handling units, pumps, or other
21 mechanical equipment served by emergency power shall be connected to the emergency
22 power system. Control components shall not be powered from the life safety branch of the
23 emergency power system. Coordinate emergency power source connections with the
24 Architect/Engineer.
- 25 L. All hardware, software, equipment, accessories, wiring (power and sensor), piping, relays,
26 sensors, power supplies, transformers, and instrumentation required for a complete and
27 operational FMCS system, but not shown on the electrical drawings, are the responsibility
28 of the TCC.
- 29 M. Labels For Control Devices:
- 30 1. Provide labels indicating service of all control devices in panels and other
31 locations.
- 32 2. Labels may be made with permanent marking pen in the control panels if clearly
33 legible.
- 34 3. Use engraved labels for items outside panel such as outside air thermostats.
- 35 4. Labels are not required for room thermostats, damper actuators and other items
36 where their function is obvious.
- 37 3.2 CONDUIT INSTALLATION
- 38 A. Conduit Sizing and Installation: Refer to Electrical Section 26 05 33 for execution and
39 installation.
- 40 1. Thermostats/temperature sensors shall be installed in junction boxes, flush with
41 the wall, and shall be coordinated for orientation with Architect/Engineer.

1 3.3 WIRE AND CABLE INSTALLATION

2 A. Wire and Cable Materials Installation: Refer to Electrical Section 26 05 13 for execution
3 and installation.

4 B. Field Quality Control:

5 1. Inspect wire and cable for physical damage and proper connection.

6 2. Torque test conductor connections and terminations to manufacturer's
7 recommended values.

8 3. Perform continuity test on all conductors.

9 4. Protection of cable from foreign materials:

10 a. It is the Contractor's responsibility to provide adequate physical
11 protection to prevent foreign material application or contact with any
12 cable type. Foreign material is defined as any material that would
13 negatively impact the validity of the manufacturer's performance
14 warranty. This includes, but is not limited, to overspray of paint
15 (accidental or otherwise), drywall compound, or any other surface
16 chemical, liquid or compound that could come in contact with the cable,
17 cable jacket or cable termination components.

18 b. Overspray of paint on any cable, cable jacket or cable termination
19 component will not be accepted. It shall be the Contractor's
20 responsibility to replace any component containing overspray, in its
21 entirety, at no additional cost to the project. Cleaning of the cables with
22 harsh chemicals is not allowed. This requirement is regardless of the
23 PASS/FAIL test results of the cable containing overspray. Should the
24 manufacturer and warrantor of the structured cabling system desire to
25 physically inspect the installed condition and certify the validity of the
26 structured cabling system (via a signed and dated statement by an
27 authorized representative of the structured cabling manufacturer), the
28 Owner may, at their sole discretion, agree to accept said warranty in lieu
29 of having the affected cables replaced. In the case of plenum cabling, in
30 addition to the statement from the manufacturer, the Contractor shall also
31 present to the Owner a letter from the local Authority Having Jurisdiction
32 stating that they consider the plenum rating of the cable to be intact and
33 acceptable.

34 C. Installation Schedule:

35 1. Conduit terminations to all devices installed in applications with rotating
36 equipment, expansion/contraction or vibration shall be made with flexible metallic
37 conduit, unless noted otherwise. Final terminations to exterior devices installed in
38 damp or wet locations shall be made with liquidtight flexible metallic conduit.
39 Terminations in hazardous areas, as defined in the National Electrical Code, shall
40 be connected using flexible conduit rated for the environment.

41 3.4 FMCS INSTALLATION

42 A. Coordinate voltage and ampacity of all contacts, relays, and terminal connections of
43 equipment being monitored or controlled. Voltage and ampacity shall be compatible with
44 equipment voltage and be rated for full ampacity of wiring or overcurrent protection of
45 circuit controlled.

- 1 B. Naming Conventions: Coordinate all point naming conventions with Owner standards. In
2 the absence of Owner standards, naming conventions shall use equipment designations
3 shown on plans.
- 4 3.5 COMMISSIONING
- 5 A. Upon completion of the installation, this Contractor shall load all system software and start
6 up the system. This Contractor shall perform all necessary calibration, testing and de-
7 bugging and perform all required operational checks to ensure that the system is
8 functioning in full accordance with these specifications.
- 9 B. This Contractor shall perform tests to verify proper performance of components, routines,
10 and points. Repeat tests until proper performance results. This testing shall include a
11 point-by-point log to validate 100% of the input and output points of the FMCS system
12 operation.
- 13 C. This Contractor shall prove that the controls network is functioning correctly and within
14 acceptable bandwidth criteria and shall test the system with an approved protocol analysis
15 tool. Provide a log and statistics summary showing that each channel is within acceptable
16 parameters. Each channel shall be shown to have at least 25% spare capacity for future
17 expansion.
- 18 D. Upon completion of the performance tests described above, repeat these tests, point by
19 point, as described in the validation log above in the presence of Owner's Representative,
20 as required. Properly schedule these tests so testing is complete at a time directed by the
21 Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or
22 building occupancy.
- 23 E. System Acceptance: Satisfactory completion is when this Contractor has performed
24 successfully all the required testing to show performance compliance with the requirements
25 of the Contract Documents to the satisfaction of the Owner's Representative. System
26 acceptance shall be contingent upon completion and review of all corrected deficiencies.
- 27 3.6 PREPARATION FOR BALANCING
- 28 A. Verify that all dampers are in the position indicated by the controller (e.g., open, closed or
29 modulating).
- 30 B. Check the calibration and setpoints of all controllers.
- 31 C. Check the locations of all thermostats for potential erratic operation from outside
32 influences such as sunlight, drafts, or cold walls.
- 33 D. Check that all sequences operate as specified. Verify that no simultaneous heating and
34 cooling occurs, unless specified.
- 35 E. Verify the operation of all interlock systems.
- 36 3.7 DEMONSTRATION AND ACCEPTANCE
- 37 A. At completion of installation, provide two days minimum instruction for operators.
38 Demonstrate operation of all controls and systems. Describe the normal operation of all
39 equipment.

1 3.8 TRAINING

2 A. On-Site:

3 1. After completion of commissioning, the manufacturer shall provide 1 hour of
4 training.

5 3.9 INSTALLATION OF SENSORS

6 A. Install sensors in accordance with the manufacturer's recommendations.

7 B. Mount sensors rigidly and adequately for the environment within which the sensor
8 operates.

9 C. Room temperature sensors shall be installed on concealed junction boxes properly
10 supported by the wall framing.

11 D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air
12 transmitted from other areas affecting sensor readings.

13 E. Averaging sensors and low limits shall be installed at the top of the assembly with the
14 element on a slight downward incline away from the sensor making a serpentine pattern
15 over the cross-sectional area with elements spaced not over 12" apart and within 6" of the
16 top and bottom of the area.

17 F. All pipe-mounted temperature sensors shall be installed in immersion wells. Install all
18 liquid temperature sensors with heat-conducting fluid in thermal wells.

19 G. Install outdoor air temperature sensors on exterior of north wall, complete with sun shield
20 at designated location approved by Architect/Engineer. TCC shall prime and paint the
21 device enclosure. Color selection by Architect.

22 H. Install all wall-mounted CO2 sensors between 3 feet and 6 feet above the floor.

23 END OF SECTION

1

SECTION 23 21 00 - HYDRONIC PIPING

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Pipe and Pipe Fittings.
- 5 B. Valves.
- 6 C. Heating Water Piping System.

7 1.2 QUALITY ASSURANCE

- 8 A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured
9 valves are not acceptable.
- 10 B. Welding Materials, Procedures, and Operators: Conform to ASME Section 9, ANSI/AWS
11 D1.1, and applicable state labor regulations.

12 1.3 DELIVERY, STORAGE, AND HANDLING

- 13 A. Store and protect piping to prevent entrance of foreign matter into pipe and to prevent
14 exterior corrosion.
- 15 B. Deliver and store valves in shipping containers with labeling in place.

16 **PART 2 - PRODUCTS**

17 2.1 HEATING WATER

- 18 A. Design Pressure: 125 psig.
19 Maximum Design Temperature: 225°F.
- 20 B. Piping - All Sizes:
 - 21 1. Tubing: Type L drawn temper seamless copper tube, ASTM B88.
 - 22 2. Joints: Solder with Type 95-5 solder. 50-50 solder is not acceptable.
 - 23 3. Fittings: Wrought copper solder joint, ASME B16.22.
- 24 C. Shutoff Valves:
 - 25 1. Gate Valves:
 - 26 a. GA-1: 2" and under, 125 psi S @ 353°F, 300 psi WOG @ 150°F,
27 screwed, bronze, rising stem, screwed bonnet. Crane #431, Hammond
28 #IB641, Stockham #B122, Walworth #56, Milwaukee #1150, Watts #B-
29 3210, NIBCO #T-131.
 - 30 b. GA-5: 2" and under, 125 psi S @ 353°F, 200 psi WOG @ 150°F, solder
31 bronze. Crane #1334, Stockham #B108, Walworth #4SJ, Watts #B-
32 3101, NIBCO #S-111.

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2. Ball Valves:

- a. BA-1: 3" and under, 125 psi saturated steam, 600 psi WOG, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-206 BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

NOTES:

- 1) Provide extended shaft with operating handle of non-thermal conductive material and protective sleeve that allows operation of valve, adjustment of the packing, and adjustment of the memory stop without breaking the vapor seal or disturbing the insulation for all valves in insulated piping.
- 2) Provide lock out trim for all valves opening to atmosphere.

D. Strainers:

- 1. ST-1: Bronze body, screwed ends, screwed cover, 125 psi S @ 353°F, 200 psi WOG @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777, NIBCO T-122.

2.2 AIR VENTS

- A. At end of main and other points where large volume of air may be trapped - Use 1/4" globe valve, angle type, 125 psi, Crane #89, attached to coupling in top of main, 1/4" discharge pipe turned down with cap.
- B. On branch lines and small heating units - Use coin-operated air vent equal to B&G #4V, attached to 1/8" coupling in top of pipe. Install air vents on all coils and terminal heating units.

2.3 STRAINERS

- A. Unless otherwise indicated, strainers shall be Y-pattern and have stainless steel screens with perforations as follows:

Pipe Size	1/4" - 2"	2-1/2" - 8"	10" and Up
Water	1/32"	1/16"	1/8"

- B. Furnish pipe nipple with ball valve, threaded hose connection, and cap to blow down all strainer screens.
- C. Use bronze body strainers in copper piping and iron body strainers in ferrous piping.

2.4 BALANCING VALVE

- A. Rated for 125 psi working pressure and 250°F operating temperature, taps for determining flow with a portable meter, positive shutoff valves for each meter connection, memory feature, tight shutoff, and a permanent pressure drop between 1' and 2' water column at full flow with valve 100% open. Furnish with molded, removable insulation covers.
- B. Provide a nomograph to determine flow from meter reading (and valve position on units which sense pressure across a valve). Graph shall extend below the specified minimum flow.

- 1 C. Valves in copper piping shall be brass or bronze. Acceptable Manufacturers: Flow Design
2 "Accusetter", Presso "B+", Armstrong "CVB", Bell & Gossett "Circuit Setter Plus",
3 Griswold "Quickset", Gerand "BALVALVE Venturi", NIBCO 1710 (S1710L),
4 Tour&Anderson (STAD), Nexus Valve "UltraXB Orturi", Victaulic 785.
- 5 D. Valves in ferrous piping 2" or smaller shall have threaded ends and steel, brass or bronze
6 construction. Acceptable Manufacturers: Flow Design "Accusetter", Presso "B+", TA
7 Hydronics "786-789", Armstrong "CVB", Bell & Gossett "Circuit Setter Plus", Autoflow
8 "AB", Gerand "BALVALVE Venturi", NIBCO 1710 (T1710L), Nexus Valve "UltraXB
9 Orturi", Victaulic 787, or flow sensors specified in Section 23 09 00 with a specified
10 throttling valve.
- 11 E. Balancing valves in ferrous piping over 2" size shall have flanged or grooved ends and
12 steel or cast iron construction. Acceptable Manufacturers: Flow Design "Accusetter",
13 Presso "B+", Taco "Accu-flo", Armstrong "CVB-II", B&G "Circuit Setter", NIBCO 737,
14 Nexus Valve "Nextrol NXFB", Tour&Anderson (STAF, STAG), Victaulic 788/789, or
15 flow sensor specified in Section 23 09 00 with a specified throttling valve.
- 16 F. Manufacturer shall size balancing valves for the scheduled flow rate. Flow rate shall be
17 measurable on manufacturer's standard meters.

18 2.5 COMBINATION PIPING PACKAGES

- 19 A. Combination piping packages are allowed in lieu of individual components specified for
20 hydronic coils and devices containing hydronic coils. Combination piping packages shall
21 include shutoff valves, wye strainers, 1/4 turn strainer blow down valves with hose thread
22 and cap, manual balancing valves with memory stop, test plugs, manual air vents, and
23 unions. Automatic flow control devices are not allowed. Configuration of combination
24 pieces shall match layouts on the drawings. Each component of the combination piping
25 packages shall meet these specifications for the individual components being combined.
- 26 B. Acceptable Manufacturers: Nexus Coil Pak, FDI Flowset, Griswold, HCI Terminator,
27 Hays Mesurflo.

28 2.6 CONNECTIONS BETWEEN DISSIMILAR METALS

- 29 A. Connections between dissimilar metals shall be insulating dielectric types that provide a
30 water gap between the connected metals, and that either allow no metal path for electron
31 transfer or that provide a wide water gap lined with a non-conductive material to impede
32 electron transfer through the water path.
- 33 B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in
34 which they are used, including testing procedure.
- 35 C. Aluminum, iron, steel, brass, copper, bronze, and stainless steel are commonly used and
36 require isolation from each other with the following exceptions:
- 37 1. Iron, steel, and stainless steel connected to each other.
- 38 2. Brass, copper, and bronze connected to each other.
- 39 3. Brass or bronze valves and specialties connected to steel, iron, or stainless steel in
40 closed systems. Where two brass or bronze items occur together, they shall be
41 connected with brass nipples.
- 42 D. Dielectric protection is required at connections to equipment of a material different than the
43 piping.

- 1 E. Screwed Joints (acceptable up to 2" size):
- 2 1. Dielectric waterway rated for 300 psi CWP and 225°F.
- 3 2. Acceptable Manufacturers: Elster Group ClearFlow fittings, Victaulic Series 47,
4 Grinnell Series 407, Matco-Norca.
- 5 F. Flanged Joints (any size):
- 6 1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.
- 7 2. Employ one-piece molded sleeve-washer combinations to break the electrical path
8 through the bolts.
- 9 3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick
10 and washers minimum 1/8" thick.
- 11 4. Install steel washers on both sides of flanges to prevent damage to the
12 sleeve-washer.
- 13 5. Separate sleeves and washers may be used only if the sleeves are manufactured to
14 exact lengths and installed carefully so the sleeves must extend partially past each
15 steel washer when tightened.
- 16 6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator,
17 F. H. Maloney, or Calpico.
- 18 2.7 LOCK OUT TRIM
- 19 A. Provide lock out trim for all quarter turn valves opening to atmosphere installed in heating
20 water piping over 120°F and as indicated on the drawings.

21 **PART 3 - EXECUTION**

22 3.1 PREPARATION

- 23 A. Ream pipe and tube ends, remove burrs, bevel plain end ferrous pipe.
- 24 B. Remove scale and dirt on inside and outside before assembly.
- 25 C. Connect to all equipment with flanges or unions.
- 26 D. After completion, fill, clean, and treat systems. Refer to Section 23 25 00 for treatment.

27 3.2 TESTING PIPING

28 A. Heating Water:

- 29 1. Test pipes in chases and walls before piping is concealed.
- 30 2. Complete testing before insulation is applied. If insulation is applied before pipe is
31 tested and a leak ruins the insulation, replace all damaged insulation.
- 32 3. Test the pipe with 100 psig water pressure. Hold pressure for at least two hours.
- 33 4. Test to be witnessed by the Architect/Engineer or their representative, if requested
34 by the Architect/Engineer.

1 3.3 CLEANING PIPING

2 A. Assembly:

- 3 1. Prior to assembly of pipe and piping components, remove all loose dirt, scale, oil
4 and other foreign matter on internal or external surfaces by means consistent with
5 good piping practice subject to approval of the Architect/Engineer. Blow chips
6 and burrs out of pipe before assembly. Wipe cutting oil from internal and external
7 surfaces.
- 8 2. During fabrication and assembly, remove slag and weld spatter from both internal
9 and external joints by peening, chipping and wire brushing to the degree
10 consistent with good piping practices.
- 11 3. Notify the Architect/Engineer prior to starting any post erection cleaning
12 operation in time to allow witnessing the operation. Properly dispose of cleaning
13 and flushing fluids.
- 14 4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation
15 and equipment, open wide all valves, control valves, and balance valves, and
16 verify all strainer screens are in place.

17 3.4 INSTALLATION

18 A. General Installation Requirements:

- 19 1. Route piping in orderly manner, straight, plumb, with consistent pitch, parallel to
20 building structure, with minimum use of offsets and couplings. Provide only
21 offsets required for needed headroom or clearance and needed flexibility in pipe
22 system.
- 23 2. Install piping to conserve building space, and not interfere with other work.
- 24 3. Group piping whenever practical at common elevations.
- 25 4. Install piping to allow for expansion and contraction without stressing pipe, joints,
26 or connected equipment.
- 27 5. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be
28 the size of the largest pipe shown connecting to it. Where pipe sizes are not
29 shown, the larger size in either direction shall continue through the fitting nearest
30 to the indication of a smaller pipe size.
- 31 6. Install bell and spigot pipe with bells upstream.
- 32 7. Seal pipes passing through exterior walls with a wall seal per Section 23 05 29.
33 Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.
- 34 8. Branch takeoffs shall be from the top, side, or bottom of piping.

35 B. Installation Requirements in Electrical Rooms:

- 36 1. Do not install piping or other equipment above electrical switchboards or
37 panelboards. This includes a dedicated space extending 25 feet from the floor to
38 the structural ceiling with width and depth equal to the equipment plus its required
39 clearance space.

- 1 C. Valves/Fittings and Accessories:
- 2 1. Provide chain operators for all valves over 2" size that are over 10'-0" above
3 finished floor. Extend to 7'-0" above finished floor.
- 4 2. Provide valve position indicator on all valves 10'-0" or greater above finish floor
5 and not located above ceiling.
- 6 3. Provide clearance for installation of insulation, and access to valves and fittings.
- 7 4. Provide access doors where valves are not exposed.
- 8 5. Install balancing valves with the manufacturer's recommended straight upstream
9 and downstream diameters of pipe.
- 10 6. Prepare pipe, fittings, supports, and accessories for finish painting.
- 11 7. Install valves with stems upright or horizontal, not inverted, except install manual
12 quarter turn valves in radiation cabinets and all butterfly valves with stems
13 horizontal.
- 14 8. Provide shutoff valves and flanges or unions at all connections to equipment,
15 traps, and items that require servicing.
- 16 9. Provide flanges or unions at all final connections to equipment, traps and valves.
- 17 10. Arrange piping and piping connections so equipment may be serviced or totally
18 removed without disturbing piping beyond final connections and associated
19 shutoff valves.

20 3.5 PIPE ERECTION AND LAYING

- 21 A. Carefully inspect all pipe, fittings, valves, equipment and accessories prior to installation.
22 Immediately reject and remove from the job any items which are unsuitable, cracked or
23 otherwise defective.
- 24 B. All pipe, fittings, valves, equipment and accessories shall have factory-applied markings,
25 stampings, or nameplates sufficient to determine their conformance with specified
26 requirements.
- 27 C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of
28 foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or
29 install any unclean item.
- 30 D. During construction, until system is fully operational, keep all openings in piping and
31 equipment closed at all times except when actual work is being performed on that item.
32 Closures shall be plugs, caps, blind flanges or other items designed for this purpose.
- 33 E. Change direction of pipes only with fittings or pipe bends. Change size only with fittings.
34 Do not use miter fittings, face or flush bushings, or street elbows. **All fittings shall be**
35 **long radius type**, unless otherwise shown on the drawings or specified. Construct welded
36 elbows of angles not available as standard fittings by cutting and welding standard elbows
37 to form smooth, long radius fittings.
- 38 F. Use full and double lengths of pipe wherever possible.
- 39 G. Unless otherwise indicated, install all inlet and outlet piping, including shutoff valves and
40 strainers, to coils, pumps and other equipment at line size with reduction in size being
41 made only at control valve or pump.

- 1 H. Cut all pipe to exact measurement and install without springing or forcing except in the
2 case of expansion loops where cold springing is indicated on the drawings.
- 3 I. Do not create, even temporarily, undue loads, forces or strains on valves, equipment or
4 building elements.
- 5 3.6 DRAINING AND VENTING
- 6 A. Unless otherwise indicated on the drawings, all horizontal pipes, including branches, shall
7 pitch 1" in 40 feet to low points for complete drainage, removal of condensate, and venting.
- 8 B. Provide drain valves at all low points of water piping systems or where indicated on
9 drawings for complete or sectionalized draining. Drain valves are defined above.
- 10 C. Use eccentric reducing fittings on horizontal runs when changing size for proper drainage
11 and venting. Install all liquid lines with top of pipe and eccentric reducers in a continuous
12 line.
- 13 D. Provide air vents at all high points and wherever else required for elimination of air in all
14 water piping systems. Do not use automatic air vents in glycol systems unless they are
15 piped to the fill tank.
- 16 E. Air vents shall be in accessible locations. If needed to trap and vent air in a remote
17 location, a 1/8" pipe shall connect the tapping location to a venting device in an accessible
18 location.
- 19 F. All vent and drain piping shall be of same materials and construction as the service
20 involved.
- 21 3.7 BRANCH CONNECTIONS
- 22 A. Make branch connections with standard tee or cross fittings of the type required for the
23 service unless otherwise specified herein or detailed on the drawings.
- 24 B. At the option of the Contractor, branch connections from headers and mains may be cut
25 into black steel pipe using forged weld-on fittings.
- 26 C. Use of forged weld-on fittings is also limited as follows:
- 27 1. Must have at least same pressure rating as the main.
28 2. Header or main must be 2-1/2" or over.
29 3. Branch line is at least two pipe sizes under header or main size.
- 30 3.8 JOINING OF PIPE
- 31 A. Threaded Joints:
- 32 1. Ream pipe ends and remove all burrs and chips.
33 2. Protect plated pipe and valve bodies from wrench marks when making up joints.
34 3. Apply Teflon tape to male threads.
- 35 B. Solder Joints:
- 36 1. Make up joints with 95% tin and 5% antimony (95-5) solder conforming to
37 ASTM B32 Grade 95TA. Cut copper tubing ends perfectly square and remove all
38 burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing
39 to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but
40 sparingly, to all surfaces to be joined. Heat joints uniformly to proper soldering
41 temperature so solder flows to all mated surfaces. Wipe excess solder, leaving a
42 uniform fillet around cup of fitting.

- 1
2. Flux shall be non-acid type conforming to ASTM B813.
- 2
3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470°F melting point solder. Remove composition discs and all seals during soldering if not suitable for 470°F.
- 3
- 4

5

END OF SECTION

- 1 c. Tie rods must not exceed 1/2" diameter.
- 2 d. Manufacturer of tie rod system must certify pressure classifications of
- 3 various arrangements, and this must be in the shop drawings.

4 2.3 DUCTWORK SEALANTS

- 5 A. One part joint sealers shall be water-based mastic systems that meet the following
- 6 requirements: maximum 48-hour cure time, service temperature of -20°F to +175°F,
- 7 resistant to mold, mildew and water, flame spread rating below 25 and smoke-developed
- 8 rating below 50 when tested in accordance with ASTM E84, suitable for all SMACNA seal
- 9 classes and pressure classes. Mastic used to seal flexible ductwork shall be marked UL
- 10 181B-M.
- 11 B. Two-part joint sealers shall consist of a minimum 3" wide mineral-gypsum compound
- 12 impregnated fiber tape and a liquid sealant. Sealant system shall meet the following
- 13 requirements: maximum 48-hour cure time, service temperature of 0°F to 200°F, resistant
- 14 to mold, mildew, and water, flame spread rating below 25 and smoke developed rating
- 15 below 50 when tested in accordance with ASTM E84, suitable for all SMACNA seal
- 16 classes and pressure classes.
- 17 C. Pressure sensitive tape used for sealing ductwork shall be minimum 2.5-inch wide, listed
- 18 and marked UL 181A-P, having minimum 60 oz/inch peel adhesion to steel, and service
- 19 temperature range from -20°F to +250°F.
- 20 D. Where pressure sensitive tape is called for on drawings and specifications for sealing
- 21 flexible ductwork, tape shall be minimum 2.5-inch wide, UL 181 B-FX listed, and marked
- 22 tape having minimum 60 oz/inch peel adhesion to steel and service temperature range from
- 23 -20°F to +250°F. Acceptable manufacturers include: Venture Tape 1581A, Compac #340,
- 24 Scotch Foil Tape 3326, Polyken 339.

25 2.4 RECTANGULAR DUCT - SINGLE WALL

- 26 A. General Requirements:
- 27 1. All ductwork gauges and reinforcements shall be as listed in SMACNA Duct
- 28 Construction Standards Chapter 2. Where necessary to fit in confined spaces,
- 29 furnish heaviest duct gauge and least space consuming reinforcement.
- 30 2. Transitions shall not exceed the angles in Figure 4-7.
- 31 B. Exceptions and modifications to the 2005 HVAC Duct Construction Standards are:
- 32 1. All ducts shall be cross-broken or beaded.
- 33 2. Turning vanes shall be used in all 90° mitered elbows, unless clearly noted
- 34 otherwise on the drawings. Vanes shall be as follows:
- 35 a. Type 1:
- 36 1) **Description:** Single wall type with 22-gauge (0.029") or
- 37 heavier vanes, 3-1/4" blade spacing, and 4" to 4-1/2" radius.
- 38 Vanes hemmed if recommended by runner manufacturer.
- 39 Runners shall have extra long locking tabs. C-value
- 40 independently tested at below 0.26. EZ Rail II by Sheet Metal
- 41 Connectors or equal.
- 42 2) **Usage:** Limited to 3,000 fpm and vane lengths 36" and under.

- 1 b. Turning vanes shall operate quietly. Repair or replace vanes that rattle or
2 flutter.
- 3 c. Runners must be installed at a 45° angle. Elbows with different size inlet
4 and outlet must be radius type.
- 5 d. Omitting every other vane is prohibited.
- 6 3. Where smooth radius rectangular elbows are shown, they shall be constructed per
7 SMACNA Figure 4-2. Type RE1 shall be constructed with a centerline duct radius
8 R/W of 1.0. Where shown on drawings, Type RE3 elbows with 3 vanes shall be
9 used with centerline duct radius R/W of 0.6 (SMACNA r/W=0.1). RE1 or RE3
10 elbows may be used where mitered elbows are shown if space permits. **Mitered**
11 **elbows (with or without turning vanes) may not be substituted for radius**
12 **elbows.** Do not make branch takeoffs within 4 duct diameters on the side of the
13 duct downstream from the inside radius of radius elbows.
- 14 4. Rectangular branch and tee connections in ducts over 1" pressure class shall be
15 45° entry type per Figs. 4-5 and 4-6. Rectangular straight taps are not acceptable
16 above 1" pressure class.
- 17 5. Bellmouth fittings shown on return duct inlets shall expand at a 60-degree total
18 angle horizontally and vertically (space permitting) and have length of at least
19 25% of the smallest duct dimension.
- 20 6. Round taps off rectangular unlined ducts shall be flanged conical or bellmouth
21 type (equal to Buckley Bellmouth or Sheet Metal Connectors E-Z Tap), or 45°
22 rectangular with transition to round (equal to Sheet Metal Connectors Inc. High
23 Efficiency Takeoff). Straight taps are acceptable if pressure class is 1" or less,
24 round duct is 12" diameter or less, and the tap is not located between fans and
25 TAB devices.
- 26 7. Duct offsets shall be constructed as shown on drawings. Additional offsets
27 required in the field shall be formed of mitered elbows without turning vanes for
28 offsets up to 30° maximum angle in accordance with SMACNA offset Type 2.
29 Offsets of greater than 30° angle shall be formed of radius elbows with centerline
30 radius R/W=1.0 or greater. SMACNA Type 1 offsets are not permitted.
- 31 8. Slide-on flanged transverse joint systems are acceptable provided they are a
32 manufactured product that has been tested for conformance with Chapter 2 of the
33 SMACNA HVAC Duct Construction Standards for sheet and joint deflection at
34 the specified pressure class.
- 35 a. Apply sealant to all inside corners. Holes at corners are not acceptable.
- 36 b. Acceptable Manufacturers: Ductmate Industries - 25/35/45, Nexus, Mez,
37 or WDCI. Other manufacturers must submit test data and fabrication
38 standards and receive Architect/Engineer's approval before any
39 fabrication begins.
- 40 9. Formed-on flanged transverse joint systems are acceptable provided they are a
41 manufactured product that has been tested for conformance with Chapter 2 of the
42 SMACNA HVAC Duct Construction Standards for sheet and joint deflection at
43 the specified pressure class.
- 44 a. Apply sealant to all inside corners. Holes at corners are not acceptable.
- 45 b. Flanges shall be 24-gauge minimum (not 26 gauge).

1 c. Acceptable Manufacturers: Lockformer TDC, TDF, United McGill, or
2 Sheet Metal Connectors. Other manufacturers must submit test data and
3 fabrication standards and receive Architect/Engineer's approval before
4 any fabrication begins.

5 2.5 ROUND AND FLAT OVAL DUCTWORK - SINGLE WALL

- 6 A. Conform to applicable portions of Rectangular Duct Section. Round or flat oval ductwork
7 may be substituted for rectangular ductwork where approved by the Architect/Engineer.
8 The spiral seam ductwork shall meet the standards set forth in this specification. The
9 ductwork shall meet or exceed the specified cross-sectional area and insulation
10 requirements. The substitution shall be coordinated with all other trades prior to
11 installation.
- 12 B. Snap lock seams are not permitted.
- 13 C. Flat oval duct in negative pressure applications shall have flat sides reinforced as required
14 for rectangular ducts of the same gauge with dimensions equal to the flat span of the oval
15 duct.
- 16 D. 90° elbows shall be smooth radius or have a minimum of five sections with mitered joints
17 and R/D of at least 1.5.
- 18 E. Duct and fittings shall meet the required minimum gauges listed in chapter 3 of the
19 SMACNA requirements for the specified pressure class. Ribbed and lightweight duct are
20 not permitted.
- 21 F. Ductwork shall be suitable for velocities up to 5,000 fpm.
- 22 G. Divided flow fittings may be made as separate fittings or factory installed taps with sound,
23 airtight, continuous welds at intersection of fitting body and tap.
- 24 H. Spot weld and bond all fitting seams in the pressure shell. Coat galvanizing damaged by
25 welding with corrosion resistant paint to match galvanized duct color.
- 26 I. Ducts with minor axis less than 22" shall be spiral seam type. Larger ducts may be rolled,
27 longitudinal welded seam type. SMACNA seams RL-2 and RL-3 are not permitted.
- 28 J. Reinforce flat oval ducts with external angles. Internal tie rods are permitted only as
29 indicated for rectangular ductwork.
- 30 K. Transverse Joint Connections:
- 31 1. Crimped joints are not permitted.
- 32 2. Ducts and fittings 36" in diameter and smaller shall have slip joint connections.
33 Size fitting ends to slip inside mating duct sections with minimum 2-inch insertion
34 length and a stop bead. Use inside slip couplings for duct-to-duct joints, and
35 outside slip couplings for fitting-to-fitting joints.
- 36 3. Ducts and fittings larger than 36" shall have flanged connections.
- 37 4. Secure all joints with at least 3 sheet metal screws before sealing.
- 38 5. Slide-on flanges as manufactured by Ductmate Industries, Accuflange, or Sheet
39 Metal Connectors are acceptable. Self-sealing duct systems are also acceptable
40 (Lindab, Ward "Keating Coupling").

1 2.6 FLEXIBLE DUCT

- 2 A. Flexible duct shall be listed and labeled as UL 181 Class 1 Air Duct Material, and shall
3 comply with NFPA 90A and 90B, and meet GSA, FHA and other U.S. Government agency
4 standards. Flexible duct shall bear the ADC Seal of Certification.
- 5 B. Flame Spread/Smoke Developed: Not over 25/50.
- 6 C. Flexible duct shall have corrosion-resistant wire helix, bonded to an inner liner that
7 prevents air from contacting the insulation, covered with minimum 1-1/2", 3/4 lb/cf density
8 fiberglass insulation blanket, sheathed in a vapor barrier of metalized polyester film
9 laminated to glass mesh.
- 10 D. Inner liner shall be airtight and suitable for 6" WC static pressure through 10" diameter and
11 shall be airtight and suitable for 4" WC static pressure 12" through 16" diameter. Outer
12 jacket shall act as a vapor barrier only with permeance not over 0.1 perm per ASTM E96,
13 Procedure A. "R" value shall not be less than 4.0 ft²*°F*hr/Btuh. Temperature range of at
14 least 0-180°F. Maximum velocity of 4,000 fpm.
- 15 E. Usage:
- 16 1. Take-offs from supply ducts to inlets of terminal air boxes. Do not exceed 36" in
17 length.
- 18 2. Connections to air inlets and outlets. Do not exceed 6'-0" in length.
- 19 F. Stretch all flexible duct to prevent sags and reduce air friction. Shorten and reinstall all
20 sagging or loose flexible duct. Avoid sharp elbows. Elbows shall maintain 1.5 diameter
21 centerline turning radius.
- 22 G. Install per the SMACNA Flexible Duct Manual. Secure inner layer with draw band. Wrap
23 with pressure sensitive tape for protection prior to installing draw band. Pressure sensitive
24 tape alone is not acceptable.

25 **PART 3 - EXECUTION**

26 3.1 INSTALLATION

- 27 A. Provide openings in ducts for thermometers and controllers.
- 28 B. Locate ducts with space around equipment for normal operation and maintenance.
- 29 C. Do not install ducts or other equipment above electrical switchboards or panelboards. This
30 includes a dedicated space extending 25 feet from the floor to the structural ceiling with
31 width and depth equal to the electrical equipment. Unless intended to serve these rooms,
32 do not install any ductwork or equipment in electrical rooms, transformer rooms, electrical
33 closets, telephone rooms or elevator machine rooms
- 34 D. During construction provide temporary closures of metal or taped polyethylene on open
35 ducts to prevent dust from entering ductwork.
- 36 E. Repair all duct insulation and liner tears.
- 37 F. Install manual volume dampers in branch supply ducts so all outlets can be adjusted. Do
38 not install dampers at air terminal device or in outlets, unless specifically shown.
- 39 G. Insulate terminal air box reheat coils. Seal insulation tight to form a tight vapor barrier.

- 1 H. Install flexible duct in accordance with the ADC Flexible Duct Performance and
2 Installation Standards.
- 3 I. Flexible duct shall NOT be joined to flat-oval connections. Provide sheet metal oval-to-
4 round transitions where required, to include, but not limited to, all connections to air inlets,
5 air outlets, and terminal air boxes.
- 6 J. Install all exterior ductwork per SMACNA Fig. 6-3. Where drawings do not indicate
7 otherwise, ductwork seams and joints shall be sealed watertight and pitched to shed water.
- 8 K. Support all duct systems in accordance with the SMACNA HVAC Duct Construction
9 Standards: Metal and Flexible.
- 10 L. Adhesives, sealants, tapes, vapor retarders, films, and other supplementary materials added
11 to ducts, plenums, housing panels, silencers, etc. shall have flame spread/smoke developed
12 ratings of under 25/50 per ASTM E84, NFPA 255, or UL 723.

13 3.2 DUCTWORK APPLICATION SCHEDULE

USAGE	MATERIAL	PRESSURE CLASS	SEAL CLASS†	INSULATION (Refer to Section 23 07 13 for insulation types)
General Exhaust Duct	Galvanized Sheet Metal	-1"	A	None
Outside Air Intake from Hood to Diffuser	Galvanized Sheet Metal	-2"	A	1-1/2" thick Type A
Ductwork Accessories (Fabric Flex Connectors, Equipment Flanges, etc.)	---	---	---	1-1/2" thick Type A
† Seal Class is per SMACNA HVAC Air Duct Leakage Test Manual				

14 3.3 DUCTWORK SEALING

- 15 A. General Requirements:
- 16 1. Openings, such as rotating shafts, shall be sealed with bushings or similar.
- 17 2. Pressure sensitive tape shall not be used as the primary sealant unless it has been
18 certified to comply with UL-181A or UL-181B by an independent testing
19 laboratory and the tape is used in accordance with that certification.
- 20 3. All connections shall be sealed including, but not limited to, taps, other branch
21 connections, access doors, access panels, and duct connections to equipment.
22 Sealing that would void product listings is not required. Spiral lock seams need
23 not be sealed.
- 24 4. Mastic-based duct sealants shall be applied to joints and seams in minimum 3 inch
25 wide by 20 mil thick bands using brush, putty knife, trowel, or spray, unless
26 manufacturer's data sheet specifies other application methods or requirements.
- 27 B. For Seal Class A ducts, all transverse joints, longitudinal seams, and duct wall penetrations
28 shall be sealed. Joints are inclusive of, but not limited to, girth joints, branch and sub-
29 branch intersections, duct collar tap-ins, fitting subsections, louver and air terminal
30 connections to ducts, access door and access panel frames and jambs, duct, plenum, and
31 casing abutments to building structures.

1 3.4 TESTING

2 A. Duct - 2" WG or Less (positive or negative):

3 1. Systems shall not leak more than shown in Table 4-1 of SMACNA HVAC Air
4 Duct Leakage Test Manual for Seal Class A.

5 2. Leak testing of these systems is not normally required for interior ductwork.
6 However, leak tests will be required if, in the opinion of the Architect/Engineer,
7 the leakage appears excessive. All exterior ductwork shall be tested. If duct has
8 outside wrap, testing shall be done before it is applied.

9 3. Leak test shall be at the Contractor's expense and shall require capping and sealing
10 all openings.

11 4. Seal ducts to bring the air leakage into compliance.

12 5. Contractor shall notify the Architect/Engineer five business days prior to
13 pressurizing ductwork for testing.

14 3.5 DUCTWORK PENETRATIONS

15 A. All duct penetrations of firewalls shall have fire or fire/smoke dampers where required by
16 code.

17 B. Dampers shall be compatible with fire rating of wall assembly. Verify actual rating of any
18 wall being penetrated with Architect/Engineer.

19 C. Seal all duct penetrations of walls that are not fire rated by caulking or packing with
20 fiberglass. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant
21 space and raw construction edges of all rectangular openings in finished rooms.

22 END OF SECTION

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ELECTRONIC FILE TRANSMITTAL - CONTRACTOR	
KJWW #: 15.0475.00	DATE:
PROJECT NAME: Monona Terrace/Roof/ Toilet Room Renovation	SOFTWARE/RELEASE:
LOCATION: Madison, Wisconsin	FILE NAME:
ARCHITECT/ ENGINEER: Paul Hansen	TRANSFER METHOD:
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Accepted by: _____	Title: _____
Company: _____	Phone: _____
Address: _____	E-mail: _____

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SECTION 23 33 00 - DUCTWORK ACCESSORIES

2 PART 1 - GENERAL

3 1.1 SECTION INCLUDES

- 4 A. Manual Volume Dampers.
- 5 B. Fabric Connectors.
- 6 C. Duct Access Doors.
- 7 D. Duct Test Holes.

8 PART 2 - PRODUCTS

9 2.1 MANUAL VOLUME DAMPERS

- 10 A. Fabricate in accordance with SMACNA Duct Construction Standards, and as indicated.
- 11 B. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inches.
- 12 C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12" x
13 72". Assemble center and edge crimped blades in prime coated or galvanized channel
14 frame with suitable hardware.
- 15 D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade
16 dampers, provide molded synthetic or oil-impregnated nylon or sintered bronze bearings.
- 17 E. Provide locking quadrant regulators on single and multi-blade dampers.
- 18 F. On insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases, or
19 adapters.
- 20 G. If blades are in open position and extend into the main duct, mount damper so blades are
21 parallel to airflow.

22 2.2 FABRIC CONNECTORS

- 23 A. Fabric connectors shall be installed between all fans or fan units and metal ducts or casings
24 to prevent transfer of fan or motor vibration.
- 25 B. The fabric connectors shall be completely flexible material which shall be in folds and not
26 drawn tight.
- 27 C. Fabric connectors shall be of glass fabric double coated with neoprene, with UL approval.
28 Weight = 30 oz. per square yard minimum. Fabric shall not be affected by mildew and
29 shall be absolutely waterproof, airtight and resistant to acids, alkalies, grease and gasoline,
30 and shall be noncombustible.
- 31 D. Fabric connections shall not exceed 6" in length on ductwork that has a positive pressure.
32 On ductwork that has a negative pressure, the length shall not exceed 2" in length.
- 33 E. All corners shall be folded, sealed with mastic and stapled on 1" centers.
- 34 F. Fabric connectors shall not be painted.
- 35 G. Unless otherwise shown on the drawings, the fabric connection at the inlet to centrifugal
36 fans shall be at least one duct diameter from the fan to prevent inlet turbulence.

- 1 H. Acceptable Materials: Durodyne MFN-4-100, Vent Fabrics, Inc. "Ventglas", or Proflex
2 PFC3NGA.
- 3 I. Fabric connectors exposed to sunlight and weather shall be as described above, except the
4 coating shall be hypalon in lieu of neoprene.
- 5 J. Acceptable Materials: Durodyne "Duralon MFD-4-100", Vent Fabrics, Inc. "Ventlon", or
6 Proflex PFC3HGA.

7 2.3 DUCT ACCESS DOORS

- 8 A. Fabricate per Fig. 7-2 and 7-3 of the SMACNA HVAC Duct Construction Standards and as
9 indicated.
- 10 B. Review locations prior to fabrication. Install access doors at fire dampers, smoke dampers,
11 motorized dampers, fan bearings, filters, automatic controls, humidifiers, louvers, duct
12 coils and other equipment requiring service inside the duct.
- 13 C. Construction shall be suitable for the pressure class of the duct. Fabricate rigid, airtight,
14 and close-fitting doors of materials identical to adjacent ductwork with sealing gaskets butt
15 or piano hinges, and quick fastening locking devices. For insulated ductwork, install
16 minimum one inch thick insulation with sheet metal cover.
- 17 D. Access doors with sheet metal screw fasteners are not acceptable.
- 18 E. Minimum size for access doors shall be 24" x16" or full duct size, whichever is less.
- 19 F. Provide quantity of access doors such that two hands can fit inside ductwork to manually
20 reset fire dampers. This will typically require one access door on the bottom and one access
21 door on an accessible side of the duct for sizes 12x12 and smaller.

22 2.4 DUCT TEST HOLES

- 23 A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene
24 plugs, threaded plugs, or threaded or twist-on metal caps.

25 **PART 3 - EXECUTION**

26 3.1 INSTALLATION

- 27 A. General Installation Requirements:
- 28 1. Install accessories in accordance with manufacturer's instructions.
- 29 2. Where duct access doors are located above inaccessible ceilings, provide ceiling
30 access doors. Coordinate location with the Architect/Engineer.
- 31 3. Coordinate and install access doors provided by others.
- 32 4. Provide access doors for all equipment requiring maintenance or adjustment above
33 an inaccessible ceiling. Minimum size shall be 24" x 24".
- 34 5. Provide duct test holes where indicated and as required for testing and balancing
35 purposes.

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B. Manual Volume Damper:

1. Provide manual volume dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts where indicated on drawings and as required for air balancing. Use splitter dampers only where indicated.
2. Provide ceiling access doors for manual volume dampers. When manual volume dampers are located above an inaccessible ceiling and an access door cannot be installed, provide a remote controlled volume control device for operation of the damper. Coordinate location with the Architect/Engineer.

END OF SECTION

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SECTION 23 37 00 - AIR INLETS AND OUTLETS

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

4 A. Grilles and Registers.

5 1.2 QUALITY ASSURANCE

6 A. Test and rate performance of air inlets and outlets per ASHRAE 70.

7 B. Test and rate performance of louvers per AMCA 500L-99.

8 C. All air handling and distribution equipment mounted outdoors shall be designed to prevent
9 rain intrusion into the airstream when tested at design airflow and with no airflow, using
10 the rain test apparatus described in Section 58 of UL 1995.

11 1.3 SUBMITTALS

12 A. Submit product data under provisions of Section 23 05 00.

13 B. Submit schedule of inlets and outlets indicating type, size, location, application, and noise
14 level.

15 C. Review requirements of inlets and outlets as to size, finish, and type of mounting prior to
16 submitting product data and schedules of inlets and outlets.

17 D. Submit manufacturer's installation instructions.

18 1.4 REGULATORY REQUIREMENTS

19 A. Conform to ANSI/NFPA 90A.

20 B. Conform to ASHRAE 90.1.

21 **PART 2 - PRODUCTS**

22 2.1 GRILLES AND REGISTERS

23 A. Reference to a grille means an air supply, exhaust or transfer device without a damper.

24 B. Reference to a register means an air supply, exhaust or transfer device with a damper.

25 C. The type of unit, margin, material, finish, etc., shall be as shown on the drawing schedule
26 and suitable for the intended use.

27 D. All margins shall be compatible with ceiling types specified (including 'Thin-Line' T-bar
28 lay-in grid system). Any discrepancies in contract documents shall be brought to the
29 attention of the Architect/Engineer, in writing, prior to Bid Date. Submission of Bid
30 indicates ceiling and air inlet and outlet types have been coordinated.

31 E. The capacity and size of the unit shall be as shown on the drawings.

32 F. All units shall handle the indicated cfm as shown on the drawings while not exceeding an
33 NC level of 25, referenced to 10⁻¹² watts with a 10 dB room effect.

- 1 G. Refer to the drawings for construction material, color and finish, margin style, deflection,
2 and sizes of grilles and registers.
- 3 H. Provide with 3/4" blade spacing. Blades shall have steel friction pivots to allow for blade
4 adjustment, plastic pivots are not acceptable.
- 5 I. Corners of steel grilles and registers shall be welded and ground smooth before painting.
6 Aluminum grilles and registers shall have staked corners.
- 7 J. Where specified to serve registers, provide opposed blade volume dampers operable from
8 the face of the register.
- 9 K. Screw holes for surface fasteners shall be countersunk for a neat appearance. Provide
10 concealed fasteners for installation in lay-in ceilings and as specified on the drawings.
- 11 L. Acceptable Manufacturers: Tuttle & Bailey, Titus, Price, Nailor, Carnes, Metalaire,
12 Krueger.

13 **PART 3 - EXECUTION**

14 3.1 INSTALLATION

- 15 A. General Installation Requirements:
- 16 1. Install items in accordance with manufacturers' instructions.
- 17 2. Check location of inlets and outlets and make necessary adjustments in position to
18 conform to architectural features, symmetry, and lighting arrangement.
- 19 3. Install diffusers to ductwork with air tight connections.
- 20 4. Flexible ducts shall NOT be joined to flat-oval connections. Provide sheet metal
21 oval-to-round transitions where required.
- 22 B. Volume Damper:
- 23 1. Provide manual volume dampers on duct take-off to diffusers when there are
24 multiple connections to a common duct. Locate volume dampers as far as
25 possible from the air inlet or outlet.

26 END OF SECTION

1

SECTION 23 82 00 - TERMINAL HEAT TRANSFER UNITS

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Unit Heaters.

5

B. Cabinet Heaters.

6

1.2 QUALITY ASSURANCE

7

A. All filters shall be UL listed Class 1 or Class 2.

8

B. All electrical equipment shall have a UL label.

9

C. All gas fired units shall be AGA approved or UL listed.

10

D. All gas trains shall comply with utility company and code requirements.

11

E. All louvers and dampers shall have AMCA certified ratings.

12

F. Factory wired equipment shall conform to ANSI/NFPA 70.

13

1.3 SUBMITTALS

14

A. Submit shop drawings per Section 23 05 00.

15

B. Submit catalog data including arrangements, cross sections of cabinets, grilles, bracing, typical elevations.

16

17

C. Submit schedules of equipment and enclosures indicating length, number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, and comparison of specified to actual heat output.

18

19

20

D. Indicate mechanical and electrical service locations and requirements. Show deviations from scheduled products.

21

22

E. Submit manufacturers' installation instructions.

23

1.4 DELIVERY, STORAGE AND HANDLING

24

A. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

25

26

1.5 REGULATORY REQUIREMENTS

27

A. Conform to ASHRAE 90.1.

28

1.6 OPERATION AND MAINTENANCE DATA

29

A. Submit manufacturer's operation and maintenance data. Include operating, installation, maintenance and repair data, and parts listings.

30

31

PART 2 - PRODUCTS

32

2.1 UNIT HEATERS

33

A. Casings shall be heavy gauge steel with a baked finish.

- 1 B. Coils shall have copper heads and tubes, and aluminum fins.
- 2 C. Units shall have threaded pipe connections for hanger rods.
- 3 D. Fans shall be direct drive propeller type, factory balanced, with fan guards and totally
- 4 enclosed motors with integral thermal overload protection.
- 5 E. Horizontal units shall have adjustable outlet air louvers.
- 6 F. Provide unit mounted and wired disconnects. Contractor shall be responsible for providing
- 7 and wiring disconnect when using a manufacturer who does not provide factory mounted
- 8 option.
- 9 G. Acceptable Products: Trane - S or P, Daikin/McQuay - UHH or UDH, Modine - HS or V,
- 10 Vulcan - HV or VV, Sterling HS or VS, Rittling - H or V, Sigma H or V, Airtherm HA or
- 11 VA.

12 2.2 HOT WATER CABINET HEATERS

- 13 A. Units shall include cabinet, fan, motor, coil, filter, inlet grille and discharge grille.
- 14 B. Cabinets: 16 gauge exposed surfaces and 18 gauge concealed surfaces. Plastic exposed
- 15 parts are not acceptable.
- 16 C. Baked enamel finish. Color selected by Architect.
- 17 D. All motors shall be three-speed permanent split capacitor with integral thermal overload
- 18 protection.
- 19 E. Coils shall have finned copper tubes.
- 20 F. Provide 1" thick disposable filters or 1/2" thick washable 65% aluminum filters ahead of
- 21 all coils.
- 22 G. Provide a concealed unit mounted fan switch with "Off-High-Medium-Low" positions that
- 23 doubles as disconnect.
- 24 H. Acceptable Manufacturers: Trane - 'Force-Flo', Sterling, Modine, Rittling, Sigma, Vulcan,
- 25 Airtherm.

26 **PART 3 - EXECUTION**

27 3.1 INSTALLATION

- 28 A. General Installation Requirements:
- 29 1. Install all products per manufacturers' instructions.
- 30 2. Coordinate recess sizes for recessed equipment.
- 31 3. Protect units with protective covers during construction.
- 32 4. Comb all coils to repair bent fins.

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DIVISION 26

1

SECTION 26 05 00 - BASIC ELECTRICAL REQUIREMENTS

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4
5

A. Requirements applicable to all Division 26 Sections. Also refer to Division 1 - General Requirements.

6
7

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced in each specification section.

8

1.2 SCOPE OF WORK

9
10

A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.

11
12
13

B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make his portion of the Electrical Work a finished and working system.

14

C. Description of Systems shall be as follows:

15
16

1. Electrical power system to and including light fixtures, equipment, motors, devices, etc.

17

2. Grounding system.

18

3. Wiring system for temperature control system as shown on the drawings.

19

4. Wiring of equipment furnished by others.

20

5. Removal work and/or relocation and reuse of existing systems and equipment.

21

D. Work Not Included:

22
23

1. Temperature control wiring for plumbing and HVAC equipment (unless otherwise indicated) will be by other Contractors.

24

1.3 WORK SEQUENCE

25
26
27
28

A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours are required.

29

B. Itemize all work and list associated hours and pay scale for each item.

30
31

1.4 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL, AND CONTROL CONTRACTORS

32
33
34
35
36
37
38

A. Division of work is the responsibility of the Prime Contractor. Any scope of work described at any location on the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described on the contract documents on bid day. The following division of responsibility is a guideline based on typical industry practice.

- 1 B. Definitions:
- 2 1. "Mechanical Contractors" refers to the Contractors listed in Division 21/22/23 of
3 this Specification.
- 4 2. Motor Power Wiring: The single phase or 3 phase wiring extending from the
5 power source (transformer, panelboard, feeder circuits, etc.) through disconnect
6 switches and motor controllers to, and including the connections to the terminals
7 of the motor.
- 8 3. Motor Control Wiring: The wiring associated with the remote operation of the
9 magnetic coils of magnetic motor starters or relays, or the wiring that permits
10 direct cycling of motors by means of devices in series with the motor power
11 wiring. In the latter case, the devices are usually single phase, have
12 "Manual-Off-Auto" provisions, and are usually connected into the motor power
13 wiring through a manual motor starter.
- 14 4. Control devices such as start-stop push buttons, thermostats, pressure switches,
15 flow switches, relays, etc., generally represent the types of equipment associated
16 with motor control wiring.
- 17 5. Motor control wiring is single phase and usually 120 volts. In some instances, the
18 voltage will be the same as the motor power wiring. When the motor power
19 wiring exceeds 120 volts, a control transformer is usually used to give a control
20 voltage of 120 volts.
- 21 6. Temperature Control Wiring: The wiring associated with the operation of a
22 motorized damper, solenoid valve or motorized valve, etc., either modulating or
23 two-position, as opposed to wiring that directly powers or controls a motor used to
24 drive equipment such as fans, pumps, etc. This wiring will be from a 120 volt
25 source and may continue as 120 volt, or be reduced in voltage (24 volt), in which
26 case a control transformer shall be furnished as part of the temperature control
27 wiring.
- 28 7. Control Motor: An electric device used to operate dampers, valves, etc. It may be
29 two-position or modulating. Conventional characteristics of such a motor are 24
30 volts, 60 cycles, 1 phase, although other voltages may be encountered.
- 31 C. General:
- 32 1. The purpose of these Specifications is to outline the Electrical and Mechanical
33 Contractors' responsibilities related to electrical work required for items such as
34 temperature controls, mechanical equipment, fans, chillers, compressors, etc. The
35 exact wiring requirements for much of the equipment cannot be determined until
36 the systems have been selected and submittals approved. Therefore, the electrical
37 drawings show only known wiring related to such items. All wiring not shown on
38 the electrical drawings, but required for mechanical systems, is the responsibility
39 of the Mechanical Contractor.
- 40 2. Where the drawings require the Electrical Contractor to wire between equipment
41 furnished by the Mechanical Contractor, such wiring shall terminate at terminals
42 provided in the equipment. The Mechanical Contractor shall furnish complete
43 wiring diagrams and supervision to the Electrical Contractor and designate the
44 terminal numbers for correct wiring.

- 1 3. The Electrical Contractor shall establish electrical utility elevations prior to
2 fabrication and installation. The Electrical Contractor shall coordinate utility
3 elevations with other trades. When a conflict arises, priority shall be as follows:
- 4 a. Lighting Fixtures
 - 5 b. Gravity flow piping, including steam and condensate.
 - 6 c. Electrical bus duct.
 - 7 d. Sheet metal.
 - 8 e. Cable trays, including access space.
 - 9 f. Other piping.
 - 10 g. Conduits and wireway.
- 11 D. Mechanical Contractor's Responsibility:
- 12 1. Assumes responsibility for internal wiring of all equipment furnished by the
13 Mechanical Contractor.
 - 14 2. Assumes all responsibility for miscellaneous items furnished by the Mechanical
15 Contractor that require wiring but are not shown on the electrical drawings or
16 specified in the Electrical Specification. If items such as relays, flow switches, or
17 interlocks are required to make the mechanical system function correctly or are
18 required by the manufacturer, they are the responsibility of the Mechanical
19 Contractor.
 - 20 3. Assumes all responsibility for Temperature Control wiring, if the Temperature
21 Control Contractor is a Subcontractor to the Mechanical Contractor.
 - 22 4. This Contractor is responsible for coordination of utilities with all other
23 Contractors. If any field coordination conflicts are found, the Contractor shall
24 coordinate with other Contractors to determine a viable layout.
- 25 E. Temperature Control Contractor's or Subcontractor's Responsibility:
- 26 1. Wiring of all devices needed to make the Temperature Control System functional.
 - 27 2. Verifying any control wiring on the electrical drawings as being by the Electrical
28 Contractor. All wiring required for the Control System, but not shown on the
29 electrical drawings, is the responsibility of the Temperature Control Contractor or
30 Subcontractor.
 - 31 3. Coordinating equipment locations (such as PE's, EP's, relays, transformers, etc.)
32 with the Electrical Contractor, where wiring of the equipment is by the Electrical
33 Contractor.
- 34 F. Electrical Contractor's Responsibility:
- 35 1. Furnishes and installs all combination starters, manual starters and disconnect
36 devices shown on the Electrical Drawings or indicated to be by the Electrical
37 Contractor in the Mechanical Drawings or Specifications.
 - 38 2. Installs and wires all remote control devices furnished by the Mechanical
39 Contractor or Temperature Control Contractor when so noted on the Electrical
40 Drawings.
 - 41 3. Furnishes and installs motor control and temperature control wiring, when noted
42 on the drawings.

- 1 4. Furnishes, installs, and connects all relays, etc., for automatic shutdown of certain
- 2 mechanical equipment (supply fans, exhaust fans, etc.) upon actuation of the Fire
- 3 Alarm System.

- 4 5. This Contractor is responsible for coordination of utilities with all other
- 5 Contractors. If any field coordination conflicts are found, the Contractor shall
- 6 coordinate with other Contractors to determine a viable layout.

7 1.5 QUALITY ASSURANCE

8 A. Contractor's Responsibility Prior to Submitting Pricing/Bid Data:

- 9 1. The Contractor is responsible for constructing complete and operating systems.
- 10 The Contractor acknowledges and understands that the Contract Documents are a
- 11 two-dimensional representation of a three-dimensional object, subject to human
- 12 interpretation. This representation may include imperfect data, interpreted codes,
- 13 utility guides, three-dimensional conflicts, and required field coordination items.
- 14 Such deficiencies can be corrected when identified prior to ordering material and
- 15 starting installation. The Contractor agrees to carefully study and compare the
- 16 individual Contract Documents and report at once in writing to the
- 17 Architect/Engineer any deficiencies the Contractor may discover. The Contractor
- 18 further agrees to require each subcontractor to likewise study the documents and
- 19 report at once any deficiencies discovered.

- 20 2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer
- 21 prior to awarding any subcontracts, ordering material, or starting any work with
- 22 the Contractor's own employees. Any work performed prior to receipt of
- 23 instructions from the Architect/Engineer will be done at the Contractor's risk.

24 B. Qualifications:

- 25 1. Only products of reputable manufacturers as determined by the
- 26 Architect/Engineer are acceptable.

- 27 2. All Contractors and subcontractors shall employ only workmen who are skilled in
- 28 their trades. At all times, the number of apprentices at the job site shall be less
- 29 than or equal to the number of journeymen at the job site.

30 C. Compliance with Codes, Laws, Ordinances:

- 31 1. Conform to all requirements of the City of Madison, Wisconsin Codes, Laws,
- 32 Ordinances and other regulations having jurisdiction over this installation.

- 33 2. If there is a discrepancy between the codes and regulations and these
- 34 specifications, the Architect/Engineer shall determine the method or equipment
- 35 used.

- 36 3. If the Contractor notes, at the time of bidding, any parts of the drawings or
- 37 specifications that do not comply with the codes or regulations, he shall inform the
- 38 Architect/Engineer in writing, requesting a clarification. If there is insufficient
- 39 time for this procedure, he shall submit with his proposal a separate price to make
- 40 the system comply with the codes and regulations.

- 41 4. All changes to the system made after the letting of the contract to comply with
- 42 codes or the requirements of the Inspector, shall be made by the Contractor
- 43 without cost to the Owner.

- 44 5. If there is a discrepancy between manufacturer's recommendations and these
- 45 specifications, the manufacturer's recommendations shall govern.

- 1 6. If there are no local codes having jurisdiction, the current issue of the National
2 Electrical Code shall be followed.
- 3 D. Permits, Fees, Taxes, Inspections:
- 4 1. Procure all applicable permits and licenses.
- 5 2. Abide by all laws, regulations, ordinances, and other rules of the State or Political
6 Subdivision where the work is done, or as required by any duly constituted public
7 authority.
- 8 3. Pay all charges for permits or licenses.
- 9 4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
- 10 5. Pay all charges arising out of required inspections by an authorized body.
- 11 6. Pay all charges arising out of required contract document reviews associated with
12 the project and as initiated by the Owner or authorized agency/consultant.
- 13 7. Where applicable, all fixtures, equipment and materials shall be listed by
14 Underwriter's Laboratories, Inc. or a nationally recognized testing organization.
- 15 8. Pay all telephone company charges related to the service or change in service.
- 16 E. Examination of Drawings:
- 17 1. The drawings for the electrical work are completely diagrammatic, intended to
18 convey the scope of the work and to indicate the general arrangements and
19 locations of equipment, outlets, etc., and the approximate sizes of equipment.
- 20 2. Contractor shall determine the exact locations of equipment and rough-ins, and the
21 exact routing of raceways so as to best fit the layout of the job. Conduit entry
22 points for electrical equipment including, but not limited to, panelboards,
23 switchboards, switchgear and unit substations, shall be determined by the
24 Contractor unless noted in the contract documents.
- 25 3. Scaling of the drawings will not be sufficient or accurate for determining these
26 locations.
- 27 4. Where job conditions require reasonable changes in arrangements and locations,
28 such changes shall be made by the Contractor at no additional cost to the Owner.
- 29 5. Because of the scale of the drawings, certain basic items, such as junction boxes,
30 pull boxes, conduit fittings, etc., may not be shown, but where required by other
31 sections of the specifications or required for proper installation of the work, such
32 items shall be furnished and installed.
- 33 6. If an item is either shown on the drawings or called for in the specifications, it
34 shall be included in this contract.
- 35 7. The Contractor shall determine quantities and quality of material and equipment
36 required from the documents. Where discrepancies arise between drawings,
37 schedules and/or specifications, the greater and better quality number shall
38 govern.
- 39 8. Where used in electrical documents the word "furnish" shall mean supply for use,
40 the word "install" shall mean connect up complete and ready for operation, and

1 the word "provide" shall mean to supply for use and connect up complete and
2 ready for operation.

3 9. Any item listed as furnished shall also be installed unless otherwise noted.

4 10. Any item listed as installed shall also be furnished unless otherwise noted.

5 F. Electronic Media/Files:

6 1. Construction drawings for this project have been prepared utilizing Revit.

7 2. Contractors and Subcontractors may request electronic media files of the contract
8 drawings and/or copies of the specifications. Specifications will be provided in
9 PDF format.

10 3. Upon request for electronic media, the Contractor shall complete and return a
11 signed "Electronic File Transmittal" form provided by KJWW.

12 4. If the information requested includes floor plans prepared by others, the
13 Contractor will be responsible for obtaining approval from the appropriate Design
14 Professional for use of that part of the document.

15 5. The electronic contract documents can be used for preparation of shop drawings
16 and as-built drawings only. The information may not be used in whole or in part
17 for any other project.

18 6. The drawings prepared by KJWW for bidding purposes may not be used directly
19 for ductwork layout drawings or coordination drawings.

20 7. The use of these CAD documents by the Contractor does not relieve them from
21 their responsibility for coordination of work with other trades and verification of
22 space available for the installation.

23 8. The information is provided to expedite the project and assist the Contractor with
24 no guarantee by KJWW as to the accuracy or correctness of the information
25 provided. KJWW accepts no responsibility or liability for the Contractor's use of
26 these documents.

27 G. Field Measurements:

28 1. Verify all pertinent dimensions at the job site before ordering any conduit,
29 conductors, wireways, bus duct, fittings, etc.

30 1.6 SUBMITTALS

31 A. Submittals shall be required for the following items, and for additional items where
32 required elsewhere in the specifications or on the drawings.

33 1. Submittals list:

<u>Referenced Specification Section</u>	<u>Submittal Item</u>
26 27 26	Wiring Devices
26 51 00	Lighting

34 B. General Submittal Procedures: In addition to the provisions of Division 1, the following are
35 required:

- 1 1. Transmittal: Each transmittal shall include the following:
 - 2 a. Date
 - 3 b. Project title and number
 - 4 c. Contractor's name and address
 - 5 d. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
 - 6 e. Description of items submitted and relevant specification number
 - 7 f. Notations of deviations from the contract documents
 - 8 g. Other pertinent data

- 9 2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:
 - 10 a. Date
 - 11 b. Project title and number
 - 12 c. Architect/Engineer
 - 13 d. Contractor and subcontractors' names and addresses
 - 14 e. Supplier and manufacturer's names and addresses
 - 15 f. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
 - 16 g. Description of item submitted (using project nomenclature) and relevant
 - 17 specification number
 - 18 h. Notations of deviations from the contract documents
 - 19 i. Other pertinent data
 - 20 j. Provide space for Contractor's review stamps

- 21 3. Composition:
 - 22 a. Submittals shall be submitted using specification sections and the project
 - 23 nomenclature for each item.

 - 24 b. Individual submittal packages shall be prepared for items in each
 - 25 specification section. All items within a single specification section shall
 - 26 be packaged together where possible. An individual submittal may
 - 27 contain items from multiple specifications sections if the items are
 - 28 intimately linked (e.g., pumps and motors).

 - 29 c. All sets shall contain an index of the items enclosed with a general topic
 - 30 description on the cover.

- 31 4. Content: Submittals shall include all fabrication, erection, layout, and setting
- 32 drawings; manufacturers' standard drawings; schedules; descriptive literature,
- 33 catalogs and brochures; performance and test data; wiring and control diagrams;
- 34 dimensions; shipping and operating weights; shipping splits; service clearances;
- 35 and all other drawings and descriptive data of materials of construction as may be
- 36 required to show that the materials, equipment or systems and the location thereof
- 37 conform to the requirements of the contract documents.

- 38 5. Contractor's Approval Stamp:
 - 39 a. The Contractor shall thoroughly review and approve all shop drawings
 - 40 before submitting them to the Architect/Engineer. The Contractor shall
 - 41 stamp, date and sign each submittal certifying it has been reviewed.

 - 42 b. Unstamped submittals will be rejected.

 - 43 c. The Contractor's review shall include, but not be limited to, verification
 - 44 of the following:
 - 45 1) Only approved manufacturers are used.
 - 46 2) Addenda items have been incorporated.

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- 3) Catalog numbers and options match those specified.
 - 4) Performance data matches that specified.
 - 5) Electrical characteristics and loads match those specified.
 - 6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
 - 7) Dimensions and service clearances are suitable for the intended location.
 - 8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
 - 9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).
- d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
 - e. **The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.**
6. Submittal Identification and Markings:
 - a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
 - b. The Contractor shall clearly indicate the size, finish, material, etc.
 - c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
 - d. All marks and identifications on the submittals shall be unambiguous.
 7. Schedule submittals to expedite the project. Coordinate submission of related items.
 8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
 9. Reproduction of contract documents alone is not acceptable for submittals.
 10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
 11. Submittals not required by the contract documents may be returned without review.
 12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
 13. Submittals shall be reviewed and approved by the Architect/Engineer **before** releasing any equipment for manufacture or shipment.

- 1 14. Contractor's responsibility for errors, omissions or deviation from the contract
2 documents in submittals is not relieved by the Architect/Engineer's approval.
- 3 C. Electronic Submittal Procedures:
- 4 1. Distribution: Email submittals as attachments to all parties designated by the
5 Architect/Engineer, unless a web-based submittal program is used.
- 6 2. Transmittals: Each submittal shall include an individual electronic letter of
7 transmittal.
- 8 3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in
9 PDF format, of paper originals are acceptable. Submittals that are not legible will
10 be rejected. Do not set any permission restrictions on files; protected, locked, or
11 secured documents will be rejected.
- 12 4. File Names: Electronic submittal file names shall include the relevant
13 specification section number followed by a description of the item submitted, as
14 follows. Where possible, include the transmittal as the first page of the PDF
15 instead of using multiple electronic files.
- 16 a. Submittal file name: 26 XX XX.description.YYYYMMDD
17 b. Transmittal file name: 26 XX XX.description.YYYYMMDD
- 18 5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files
19 shall be transmitted via a pre-approved method.

20 1.7 SCHEDULE OF VALUES

- 21 A. The requirements herein are in addition to the provisions of Division 1.
- 22 B. Format:
- 23 1. Use AIA Document Continuation Sheets G703 or another similar form approved
24 by the Owner and Architect/Engineer.
25 2. Submit in Excel format.
26 3. Support values given with substantiating data.
- 27 C. Preparation:
- 28 1. Itemize the cost for each of the following:
- 29 a. Overhead and profit.
30 b. Bonds.
31 c. Insurance.
32 d. General Requirements: Itemize all requirements.
- 33 2. Itemize work required by each specification section and list all providers. All
34 work provided by subcontractors and major suppliers shall be listed on the
35 Schedule of Values. List each subcontractor and supplier by company name.
- 36 a. Contractor's own labor forces.
37 b. All subcontractors.
38 c. All major suppliers of products or equipment.
- 39 3. Break down all costs into:
- 40 a. Material: Delivered cost of product with taxes paid.
41 b. Labor: Labor cost, excluding overhead and profit.

- 1 4. For each line item having an installed cost of more than \$5,000, break down costs
2 to list major products or operations under each item. At a minimum, provide
3 material and labor cost line items for the following:
- 4 a. Each piece of equipment requiring shop drawings. Use the equipment
5 nomenclature (SB-1, PANEL P-1, etc.) on the Schedule of Values.
6 b. Each type of small unitary equipment (e.g., FDS, FCS, CS, etc.).
7 Multiple units of the same type can be listed together provided quantities
8 are also listed so unit costs can be determined.
9 c. Each conduit system (medium voltage, normal, emergency, low voltage
10 systems, etc.). In addition, for larger projects breakdown the material and
11 labor for each conduit system based on geography (building, floor, and/or
12 wing).
13 d. Fire alarm broken down into material and labor for the following:
14 1) Engineering
15 2) Controllers, devices, sensors, etc.
16 3) Conduit
17 4) Wiring
18 5) Programming
19 6) Commissioning
20 e. Site utilities (5' beyond building)
21 f. Seismic design
22 g. Testing
23 h. Commissioning
24 i. Record drawings
25 j. Punchlist and closeout
- 26 D. Update Schedule of Values when:
- 27 1. Indicated by Architect/Engineer.
28 2. Change of subcontractor or supplier occurs.
29 3. Change of product or equipment occurs.
- 30 1.8 CHANGE ORDERS
- 31 A. A detailed material and labor takeoff shall be prepared for each change order, along with
32 labor rates and markup percentages. Change orders with inadequate breakdown will be
33 rejected.
- 34 B. Change order work shall not proceed until authorized.
- 35 1.9 PRODUCT DELIVERY, STORAGE, HANDLING AND MAINTENANCE
- 36 A. Exercise care in transporting and handling to avoid damage to materials. Store materials on
37 the site to prevent damage.
- 38 B. Keep all materials clean, dry and free from damaging environments.
- 39 C. Coordinate the installation of heavy and large equipment with the General Contractor
40 and/or Owner. If the Electrical Contractor does not have prior documented experience in
41 rigging and lifting similar equipment, he/she shall contract with a qualified lifting and
42 rigging service that has similar documented experience. Follow all equipment lifting and
43 support guidelines for handling and moving.
- 44 D. Contractor is responsible for moving equipment into the building and/or site. Contractor
45 shall review site prior to bid for path locations and any required building modifications to
46 allow movement of equipment. Contractor shall coordinate his/her work with other trades.

1 1.10 WARRANTY

2 A. Provide one-year warranty for all fixtures, equipment, materials, and workmanship.

3 B. The warranty period for all work in this specification Division shall commence on the date
4 of Substantial Completion or successful system performance whichever occurs later. The
5 warranty may also commence if a whole or partial system or any separate piece of
6 equipment or component is put into use for the benefit of any party other than the installing
7 contractor with prior written authorization of the Owner. In this instance, the warranty
8 period shall commence on the date when such whole system, partial system or separate
9 piece of equipment or component is placed in operation and accepted in writing by the
10 Owner.

11 C. Warranty requirements extend to correction, without cost to the Owner, of all work found
12 to be defective or nonconforming to the contract documents. The Contractor shall bear the
13 cost of correcting all damage due to defects or nonconformance with contract documents
14 excluding repairs required as a result of improper maintenance or operation, or of normal
15 wear as determined by the Architect/Engineer.

16 1.11 INSURANCE

17 A. This Contractor shall maintain insurance coverage as set forth in Division 1 of these
18 specifications.

19 1.12 MATERIAL SUBSTITUTION

20 A. Where several manufacturers' names are given, the manufacturer for which a catalog
21 number is given is the basis of design and establishes the quality required.

22 B. Equivalent equipment manufactured by the other named manufacturers may be used.
23 Contractor shall ensure that all items submitted by these other manufacturers meet all
24 requirements of the drawings and specifications, and fit in the allocated space. The
25 Architect/Engineer shall make the final determination of whether a product is equivalent.

26 C. Any material, article or equipment of other unnamed manufacturers which will adequately
27 perform the services and duties imposed by the design and is of a quality equal to or better
28 than the material, article or equipment identified by the drawings and specifications may be
29 used if approval is secured in writing from the Architect/Engineer via addendum. The
30 Contractor assumes all costs incurred as a result of using the offered material, article or
31 equipment, on his part or on the part of other Contractors whose work is affected.

32 D. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These
33 items will not be used in determining the low bidder. This Contractor assumes all costs
34 incurred as a result of using the offered material or equipment on his part or on the part of
35 other Contractors whose work is affected.

36 E. All material substitutions requested after the final addendum must be listed as voluntary
37 changes on the bid form.

38 **PART 2 - PRODUCTS**

39 2.1 GENERAL

40 A. All items of material having a similar function (e.g., safety switches, panelboards,
41 switchboards, contactors, motor starters, dry type transformers) shall be of the same
42 manufacturer unless specifically stated otherwise on drawings or elsewhere in
43 specifications.

1 **PART 3 - EXECUTION**

2 3.1 JOBSITE SAFETY

3 A. Neither the professional activities of the Architect/Engineer, nor the presence of the
4 Architect/Engineer or his or her employees and subconsultants at a construction site, shall
5 relieve the Contractor and any other entity of their obligations, duties and responsibilities
6 including, but not limited to, construction means, methods, sequence, techniques or
7 procedures necessary for performing, superintending or coordinating all portions of the
8 work of construction in accordance with the contract documents and any health or safety
9 precautions required by any regulatory agencies. The Architect/Engineer and his or her
10 personnel have no authority to exercise any control over any construction contractor or
11 other entity or their employees in connection with their work or any health or safety
12 precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer
13 and the Architect/Engineer's consultants shall be indemnified and shall be made additional
14 insureds under the Contractor's general liability insurance policy.

15 3.2 ARCHITECT/ENGINEER OBSERVATION OF WORK

16 A. The contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior
17 to:

18 1. Covering exterior walls, interior partitions and chases.

19 2. Installing hard or suspended ceilings and soffits.

20 B. The Architect/Engineer will review the installation and provide a written report noting
21 deficiencies requiring correction. The contractor's schedule shall account for these reviews
22 and show them as line items in the approved schedule.

23 C. Above-Ceiling Final Observation:

24 1. All work above the ceilings must be complete prior to the Architect/Engineer's
25 review. This includes, but is not limited to:

26 a. All junction boxes are closed and identified in accordance with Section
27 26 05 53 Electrical Identification.

28 b. Light fixtures, including ceiling-mounted exit and emergency lights, are
29 installed and operational.

30 c. Light fixture whips are suspended above the ceiling.

31 d. Conduit identification is installed in accordance with Section 26 05 53
32 Electrical Identification.

33 e. Light fixtures are suspended independently of the ceiling system when
34 required by these contract documents.

35 f. All wall penetrations have been sealed.

36 2. In order to prevent the Above-Ceiling Final Observation from occurring too early,
37 the Contractor shall review the status of the work and certify, in writing, that the
38 work is ready for the Above-Ceiling Final Observation.

39 3. It is understood that if the Architect/Engineer finds the ceilings have been
40 installed prior to this review and prior to seven days elapsing, the
41 Architect/Engineer may not recommend further payments to the contractor until
42 such time as full access has been provided.

1 3.3 PROJECT CLOSEOUT

2 A. The following paragraphs supplement the requirements of Division 1.

3 B. Final Jobsite Observation:

4 1. In order to prevent the Final Jobsite Observation from occurring too early, the
5 Contractor shall review the completion status of the project and certify that the job
6 is ready for the final jobsite observation.

7 2. Attached to the end of this section is a typical list of items that represent the
8 degree of job completeness expected prior to requesting a review. The Contractor
9 shall sign the attached certification and return it to the Architect/Engineer so that
10 the final observation can be scheduled.

11 3. It is understood that if the Architect/Engineer finds the job not ready for the final
12 observation and additional trips and observations are required to bring the project
13 to completion, the cost of the additional time and expenses incurred by the
14 Architect/Engineer will be deducted from the Contractor's final payment.

15 4. Contractor shall notify Architect/Engineer 48 hours prior to installation of ceilings
16 or lay-in ceiling tiles.

17 C. The following must be submitted before Architect/Engineer recommends final payment:

18 1. Operation and maintenance manuals with copies of approved shop drawings.

19 2. Record documents including reproducible drawings and specifications.

20 3. A report documenting the instructions given to the Owner's representatives
21 complete with the number of hours spent in the instruction. The report shall bear
22 the signature of an authorized agent of this Contractor and shall be signed by the
23 Owner's representatives.

24 4. Provide spare parts, maintenance, and extra materials in quantities specified in
25 individual specification sections. Deliver to project site and place in location as
26 directed and submit receipt to Architect/Engineer.

27 5. Inspection and testing report by the fire alarm system manufacturer.

28 6. Start-up reports on all equipment requiring a factory installation or start-up.

29 3.4 OPERATION AND MAINTENANCE MANUALS

30 A. General:

31 1. Provide an electronic copy of the O&M manuals as described below for
32 Architect/Engineer's review and approval. The electronic copy shall be corrected
33 as required to address the Architect/Engineer's comments. Once corrected,
34 electronic copies and paper copies shall be distributed as directed by the
35 Architect/Engineer.

36 2. Approved O&M manuals shall be completed and in the Owner's possession prior
37 to Owner's acceptance and at least 10 days prior to instruction of operating
38 personnel.

- 1 B. Electronic Submittal Procedures:
- 2 1. Distribution: Email the O&M manual as attachments to all parties designated by
- 3 the Architect/Engineer.
- 4 2. Transmittals: Each submittal shall include an individual electronic letter of
- 5 transmittal.
- 6 3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in
- 7 PDF format, of paper originals are acceptable. Submittals that are not legible will
- 8 be rejected. Do not set any permission restrictions on files; protected, locked, or
- 9 secured documents will be rejected.
- 10 4. File Names: Electronic submittal file names shall include the relevant
- 11 specification section number followed by a description of the item submitted, as
- 12 follows. Where possible, include the transmittal as the first page of the PDF
- 13 instead of using multiple electronic files.
- 14 a. O&M file name: O&M.div23.contractor.YYYYMMDD
- 15 b. Transmittal file name: O&Mtransmittal.div23.contractor.YYYYMMDD
- 16 5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files
- 17 shall be divided into files that are clearly labeled as “1 of 2”, “2 of 2”, etc.
- 18 6. Provide the Owner with an approved copy of the O&M manual on compact discs
- 19 (CD), digital video discs (DVD), or flash drives with a permanently affixed label,
- 20 printed with the title “Operation and Maintenance Instructions”, title of the project
- 21 and subject matter of disc/flash drive when multiple disc/flash drives are required.
- 22 7. All text shall be searchable.
- 23 8. Bookmarks shall be used, dividing information first by specification section, then
- 24 systems, major equipment and finally individual items. All bookmark titles shall
- 25 include the nomenclature used in the construction documents and shall be an
- 26 active link to the first page of the section being referenced.
- 27 C. Operation and Maintenance Instructions shall include:
- 28 1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all
- 29 subcontractors, and major equipment suppliers, with addresses, telephone
- 30 numbers, website addresses, email addresses and point of contacts. Website URLs
- 31 and email addresses shall be active links in the electronic submittal.
- 32 2. Table of Contents: Include a table of contents describing specification section,
- 33 systems, major equipment, and individual items.
- 34 3. Copies of all final approved shop drawings and submittals. Include
- 35 Architect’s/Engineer’s shop drawing review comments. Insert the individual shop
- 36 drawing directly after the Operation and Maintenance information for the item(s)
- 37 in the review form.
- 38 4. Copies of all factory inspections and/or equipment startup reports.
- 39 5. Copies of warranties.
- 40 6. Schematic wiring diagrams of the equipment that have been updated for field
- 41 conditions. Field wiring shall have label numbers to match drawings.
- 42 7. Dimensional drawings of equipment.

- 1 8. Detailed parts lists with lists of suppliers.
- 2 9. Operating procedures for each system.
- 3 10. Maintenance schedule and procedures. Include a chart listing maintenance
4 requirements and frequency.
- 5 11. Repair procedures for major components.
- 6 12. Replacement parts and service material requirements for each system and the
7 frequency of service required.
- 8 13. Instruction books, cards, and manuals furnished with the equipment.
- 9 14. Include record drawings of the one-line diagrams for each major system. The
10 graphic for each piece of equipment shown on the one-line diagram shall be an
11 active link to its associated Operation & Maintenance data.

12 3.5 INSTRUCTING THE OWNER'S REPRESENTATIVE

- 13 A. Adequately instruct the Owner's designated representatives in the maintenance, care, and
14 operation of the complete systems installed under this contract.
- 15 B. Provide verbal and written instructions to the Owner's representatives by FACTORY
16 PERSONNEL in the care, maintenance, and operation of the equipment and systems.
- 17 C. The Owner has the option to make a video recording of all instructions. Coordinate
18 schedule of instructions to facilitate this recording.
- 19 D. The instructions shall include:
- 20 1. Maintenance of equipment.
- 21 E. Notify the Architect/Engineer of the time and place for the verbal instructions to the
22 Owner's representative so his representative can be present if desired.
- 23 F. Minimum hours of instruction time for each item and/or system shall be as indicated in
24 each individual specification section.
- 25 G. Operating Instructions:
- 26 1. Contractor is responsible for all instructions to the Owner's representatives for the
27 electrical and specialized systems.
- 28 2. If the Contractor does not have staff that can adequately provide the required
29 instructions, he shall include in his bid an adequate amount to reimburse the
30 Owner for the Architect/Engineer to perform these services.

31 3.6 RECORD DOCUMENTS

- 32 A. The following paragraphs supplement the requirements of Division 1.
- 33 B. Maintain at the job site a separate and complete set of electrical drawings and
34 specifications with all changes made to the systems clearly and permanently marked in
35 complete detail.
- 36 C. Mark drawings and specifications to indicate approved substitutions; Change Orders, and
37 actual equipment and materials used. All Change Orders, RFI responses, Clarifications and
38 other supplemental instructions shall be marked on the documents. Record documents that

1 merely reference the existence of the above items are not acceptable. Should this
2 Contractor fail to complete Record Documents as required by this contract, this Contractor
3 shall reimburse Architect/Engineer for all costs to develop record documents that comply
4 with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly
5 rates in effect at the time of work.

6 D. Record changes daily and keep the marked drawings available for the Architect/Engineer's
7 examination at any normal work time.

8 E. Upon completing the job, and before final payment is made, give the marked-up drawings
9 to the Architect/Engineer.

10 3.7 PAINTING

11 A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and
12 color shall match original equipment paint and shall be obtained from the equipment
13 supplier if available. All equipment shall have a finished coat of paint applied unless
14 specifically allowed to be provided with a prime coat only.

15 B. Equipment in finished areas that will be painted to match the room decor will be painted by
16 others. Should this Contractor install equipment in a finished area after the area has been
17 painted, he shall have the equipment and all its supports, hangers, etc., painted to match the
18 room decor. Painting shall be performed as described in project specifications.

19 C. Equipment cabinets, casings, covers, metal jackets, etc., located in equipment rooms or
20 concealed spaces, shall be furnished in standard finish, free from scratches, abrasions,
21 chippings, etc.

22 D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with
23 baked enamel finish coat free from scratches, abrasions, chipping, etc. If color option is
24 specified or is standard to the unit, verify with the Architect his color preference before
25 ordering.

26 E. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, and storage
27 rooms. Equipment furnished with a suitable factory finish need not be painted; provided the
28 factory applied finish is not marred or spattered. If so, equipment shall be refinished with
29 the same paint as was factory applied.

30 F. All electrical conduit and equipment, fittings, hangers, structural supports, etc., in
31 unfinished areas, such as equipment and storage room area, shall be painted two (2) coats
32 of oil paint of colors selected by the Architect.

33 G. Do NOT paint electric conduits in crawl spaces, tunnels, or spaces above suspended
34 ceilings except that where conduit is in a damp location give exposed threads at joints two
35 coats of sealer after joint is made up.

36 H. After surfaces have been thoroughly cleaned and are free of oil, dirt or other foreign matter,
37 paint all raceway and equipment with the following:

38 1. Bare Metal Surfaces - Apply one coat of metal primer suitable for the metal being
39 painted. Finish with two coats of Alkyd base enamel paint.

40 2. Plastic Surfaces - Paint plastic surfaces with two coats of semi-gloss acrylic latex
41 paint.

42 3.8 ADJUST AND CLEAN

43 A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the
44 project.

- 1 B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc. from all equipment.
- 2 C. Remove all rubbish, debris, etc., accumulated during construction from the premises.
- 3 3.9 SPECIAL REQUIREMENTS
- 4 A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to
5 maintain clear access area for servicing.
- 6 B. Install all equipment to maximize access to parts needing service or maintenance. Review
7 the final location, placement, and orientation of equipment with the Owner's representative
8 prior to setting equipment.
- 9 C. Installation of equipment or devices without regard to coordination of access requirements
10 and confirmation with the Owner's representative will result in removal and reinstallation
11 of the equipment at the Contractor's expense.
- 12 3.10 INDOOR AIR QUALITY (IAQ) MAINTENANCE FOR OCCUPIED FACILITIES UNDER
13 CONSTRUCTION
- 14 A. Within the limits of Construction:
- 15 1. The Electrical Contractor shall coordinate all work with the contractor responsible
16 for IAQ.
- 17 2. The means, methods and materials used by the Electrical Contractor shall be
18 coordinated with the contractor responsible for IAQ and shall comply with the
19 IAQ requirements set forth in Division 1 and Division 21/22/23 of these
20 specifications.
- 21 B. Outside the limits of Construction:
- 22 1. IAQ shall be the responsibility of the electrical contractor for work that is required
23 outside the limits of construction.
- 24 2. The Electrical Contractor is responsible for the IAQ set forth in Division 1 and
25 Division 21/22/23 of these specifications.
- 26 3. The Electrical Contractor shall review and coordinate all IAQ plans and
27 procedures with the owner's IAQ representative.
- 28 3.11 SYSTEM COMMISSIONING
- 29 A. The electrical systems shall be complete and operating. System start-up, testing, balancing,
30 and satisfactory system performance is the responsibility of the Contractor. This includes
31 all calibration and adjustment of electrical controls, balancing of loads, troubleshooting and
32 verification of software, and final adjustments that may be needed.
- 33 B. All operating conditions and control sequences shall be tested during the start-up period.
34 Testing all interlocks, safety shut-downs, controls, and alarms.
- 35 1. The Contractor, subcontractors, and equipment suppliers shall have skilled
36 technicians to ensure that all systems perform properly. If the Architect/Engineer
37 is requested to visit the job site for trouble shooting, assisting in start-up,
38 obtaining satisfactory equipment operation, resolving installation and/or
39 workmanship problems, equipment substitution issues or unsatisfactory system
40 performance, including call backs during the warranty period, through no fault of
41 the design; the Contractor shall reimburse the Owner on a time and materials basis
42 for services rendered at the Architect/Engineer's standard hourly rates in effect

1 when the services are requested. The Contractor shall pay the Owner for services
2 required that are product, installation or workmanship related. Payment is due
3 within 30 days after services are rendered.

4 3.12 FIELD QUALITY CONTROL

5 A. General:

- 6 1. Conduct all tests required during and after construction.
- 7 2. Supply necessary instruments, meters, etc., for the tests. Supply competent
8 technicians with training in the proper testing techniques.
- 9 3. All cables and wires shall be tested for shorts and grounds following installation
10 and connection to devices. Replace shorted or grounded wires and cables.
- 11 4. Any wiring device, electrical apparatus or lighting fixture, if grounded or shorted
12 on any integral "live" part, shall have all defective parts or materials replaced.
- 13 5. Test cable insulation of service and panel feeder conductors for proper insulation
14 values. Tests shall include the cable, all splices, and all terminations. Each
15 conductor shall be tested and shall test free of short circuits and grounds and have
16 an insulation value not less than the National Electrical Code Standards. Take
17 readings between conductors, and between conductors and ground.
- 18 6. If the results obtained in the tests are not satisfactory make adjustments,
19 replacements, and changes as needed. Then repeat the tests, and make additional
20 tests, as the Architect/Engineer or authority having jurisdiction deems necessary.

21 B. Other Equipment:

- 22 1. Give other equipment furnished and installed by the Contractor all standard tests
23 normally made to assure that the equipment is electrically sound, all connections
24 properly made, phase rotation correct, fuses and thermal elements suitable for
25 protection against overloads, voltage complies with equipment nameplate rating,
26 and full load amperes are within equipment rating.

27 C. If any test results are not satisfactory, make adjustments, replacements and changes as
28 needed and repeat the tests and make additional tests as the Architect/Engineer or authority
29 having jurisdiction deem necessary.

30 END OF SECTION

31

1

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

2
3
4
5

In order to prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

6
7
8
9
10
11

- 1. Penetrations of fire-rated construction fire sealed in accordance with specifications.
- 2. Electrical panels have typed circuit identification.
- 3. Smoke and fire/smoke dampers are wired and have been tested.
- 4. Operation and Maintenance manuals have been submitted as per Section 26 05 00.
- 5. Bound copies of approved shop drawings have been submitted as per Section 26 05 00.
- 6. Report of instruction of Owner’s representative has been submitted as per Section 26 05 00.

12

Accepted by:

13

Prime Contractor _____

14

By _____ Date _____

15
16
17

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

18
19
20
21

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

22

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1

SECTION 26 05 03 - THROUGH PENETRATION FIRESTOPPING

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

- A. Through-Penetration Firestopping.

5

1.2 QUALITY ASSURANCE

6

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.

7

- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

8

9

1.3 REFERENCES

10

- A. UL 723 - Surface Burning Characteristics of Building Materials

11

- B. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops

12

- C. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)

13

- D. Warnock Hersey - Directory of Listed Products

14

- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

15

- F. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops

16

- G. The Building Officials and Code Administrators National Building Code

17

- H. Uniform Building Code

18

- I. Wisconsin Administrative Code

19

- J. 2009 International Building Code

20

- K. NFPA 5000 – Building Construction Safety Code

21

22

1.4 DELIVERY, STORAGE, AND HANDLING

23

- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.

24

25

26

27

- B. Install material prior to expiration of product shelf life.

28

1.5 PERFORMANCE REQUIREMENTS

29

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

30

31

32

33

34

- 1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.

35

36

37

- 2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.

38

- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:

39

40

- 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

41

42

- 1 2. T-Rated Systems: For the following conditions, provide through-penetration
2 firestop systems with T-ratings indicated, as well as F-ratings:
- 3 a. Floor penetrations located outside wall cavities.
4 b. Floor penetrations located outside fire-resistance-rated shaft enclosures.
- 5 C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical
6 damage, provide products that, after curing, do not deteriorate when exposed to these
7 conditions both during and after construction.
- 8 D. For through-penetration firestop systems exposed to view, provide products with flame-
9 spread and smoke-developed indexes of less than 25 and 450, respectively, as determined
10 per ASTM E 84.
- 11 E. For through-penetration firestop systems in air plenums, provide products with flame-
12 spread and smoke-developed indexes of less than 25 and 50, respectively, as determined
13 per ASTM E 84.
- 14 F. In accordance with LEED EQc4.1, Low-Emitting Materials - Adhesives and Sealants, all
15 adhesives and sealants used on the interior of the building must comply with the following
16 requirements:
- 17 1. Adhesives, sealants and sealant primers must comply with South Coast Air
18 Quality Management District (SCAQMD) Rule #1168.
- 19 2. Aerosol adhesives must comply with Green Seal Standard for Commercial
20 Adhesives GS-36 requirements in effect on October 19, 2000.

21 1.6 WARRANTY

- 22 A. Provide one year warranty on parts and labor.
- 23 B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion,
24 cohesion, abrasion resistance, weather resistance, extrusion resistance, migration
25 resistance, stain resistance, general durability, or appear to deteriorate in any manner not
26 clearly specified by the manufacturer as an inherent quality of the material.

27 **PART 2 - PRODUCTS**

28 2.1 MANUFACTURERS

- 29 A. Products: Subject to compliance with requirements, provide one of the through-penetration
30 firestop systems indicated for each application that are produced by one of the following
31 manufacturers. All firestopping systems installed shall be provided by a single
32 manufacturer.
- 33 1. 3M; Fire Protection Produces Division.
34 2. Hilti, Inc.
35 3. RectorSeal Corporation, Metacaulk.
36 4. Tremco; Sealant/Weatherproofing Division.
37 5. Johns-Manville.
38 6. Specified Technologies Inc. (S.T.I.)
39 7. Spec Seal Firestop Products
40 8. AD Firebarrier Protection Systems
41 9. Wiremold/legrand: FlameStopper

1 2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

2 A. Provide materials and systems classified by or listed by Warnock Hersey to provide
3 firestopping equal to time rating of construction being penetrated.

4 B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that
5 would require hazardous waste removal.

6 C. Firestopping shall be flexible to allow for normal penetrating item movement due to
7 expansion and contraction.

8 D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture
9 resistant.

10 E. Provide firestopping systems capable of supporting floor loads where systems are exposed
11 to possible floor loading or traffic.

12 F. Provide firestopping systems allowing continuous insulation for all insulated pipes.

13 G. Provide firestopping systems classified by UL or listed by Warnock Hersey for
14 penetrations through all fire rated construction. Firestopping systems shall be selected
15 from the UL or listed by Warnock Hersey Fire Resistance Directory Category XHEZ based
16 on substrate construction and penetrating item size and material and shall fall within the
17 range of numbers listed:

- 18 1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated
19 F Rating = Floor/Wall Rating
20 T Rating = Floor/Wall Rating

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical	FC 6000-6999
Duct without Damper and Misc. Mechanical	FC 7000-7999
Multiple Penetrations	FC 8000-8999

- 21 2. Non-Combustible Framed Walls - 1 or 2 Hour Rated
22 F Rating = Wall Rating
23 T Rating = 0

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999

- 1 3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated
2 F Rating = Wall/Floor Rating
3 T Rating (Floors) = Floor Rating

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

4 *Alternate method of firestopping is patching opening to match original rated
5 construction.

6 H. Any opening in walls or floors not covered by the listed series of numbers shall be
7 coordinated with the firestopping manufacturer.

8 I. Any openings in floors or walls not described in the UL or listed by Warnock Hersey Fire
9 Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner
10 agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having
11 Jurisdiction.

12 **PART 3 - EXECUTION**

13 3.1 EXAMINATION

14 A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose
15 materials. Clean and repair surfaces as required. Remove laitance and form-release agents
16 from concrete.

17 B. Ensure substrate and penetrating items have been permanently installed prior to installing
18 firestopping systems. Ensure penetrating items have been properly spaced and have proper
19 clearance prior to installing firestopping systems.

20 C. Surfaces to which sealing materials are to be installed must meet the selected UL or
21 Warnock Hersey system substrate criteria.

22 D. Prime substrates where recommended in writing by through-penetration firestop system
23 manufacturer. Confine primer to area of bond.

24 3.2 INSTALLATION

25 A. In existing construction, provide firestopping of openings prior to and after installation of
26 penetrating items. Remove any existing coatings on surfaces prior to firestopping
27 installation. Temporary firestopping shall consist of packing openings with fire resistant
28 mineral wool for the full thickness of substrate, or an alternate method approved by the
29 Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately
30 upon their installation and shall remain so until the permanent UL or listed by Warnock
31 Hersey listed firestopping system is installed.

32 B. Install penetration seal materials in accordance with printed instructions of the UL or
33 Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application
34 instructions.

1 C. Install dams as required to properly contain firestopping materials within openings and as
2 required to achieve required fire resistance rating. Remove combustible damming after
3 appropriate curing.

4 3.3 CLEANING AND PROTECTING

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

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

13 3.4 INSPECTION

14 A. All penetrations shall be inspected by the manufacturer's representative to ensure proper
15 installation.

16 B. Access to firestop systems shall be maintained for examination by the Authority Having
17 Jurisdiction at their request.

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

20 D. The contractor shall allow for visual destructive review of 5% of installed firestop systems
21 (minimum of one) to prove compliance with specifications and manufacturer's instructions
22 and details. Destructive system removal shall be performed by the contractor and
23 witnessed by the Architect/Engineer and manufacturer's factory representative. The
24 Architect/Engineer shall have sole discretion of which firestop system installations will be
25 reviewed. The contractor is responsible for all costs associated with this requirement
26 including labor and material for removing and replacing the installed firestop system. If
27 any firestop system is found to not be installed per manufacturer's specific instructions and
28 details, all firestop systems are subject to destructive review and replacement at the
29 Architect/Engineer's discretion and the contractor's expense.

30 END OF SECTION

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SECTION 26 05 05 - ELECTRICAL DEMOLITION FOR REMODELING

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

- A. Electrical demolition

5

PART 2 - PRODUCTS

6

2.1 MATERIALS AND EQUIPMENT

7

- A. Materials and equipment for patching and extending work shall be as specified in individual Sections.

8

9

PART 3 - EXECUTION

10

3.1 EXAMINATION

11

- A. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS.

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- B. Where walls, ceilings, structures, etc., are indicated as being removed on general or electrical drawings, the Contractor shall be responsible for the removal of all electrical equipment, devices, fixtures, raceways, wiring, systems, etc., from the removed area.

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- C. Where ceilings, walls, structures, etc., are temporarily removed and replaced by others, this Contractor shall be responsible for the removal, storage, and replacement of equipment, devices, fixtures, raceways, wiring, systems, etc.

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- D. Where mechanical or technology equipment is indicated as being removed on electrical, mechanical, or technology drawings, the Contractor shall be responsible for disconnecting the equipment and removing all starters, VFD, controllers, electrical equipment, raceways, wiring, etc. associated with the device.

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- E. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area. Extended conduit and conductors to match existing size and material.

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- F. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.

30

31

- G. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and scope of work.

32

33

3.2 PREPARATION

34

- A. The Contractor shall obtain approval from the Owner before turning off power to circuits, feeders, panels, etc. Coordinate all outages with Owner.

35

36

- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use

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- 1 personnel experienced in such operations. Assume all equipment and systems must remain
2 operational unless specifically noted otherwise on drawings.
- 3 C. Disconnect electrical systems in walls, floors, structures, and ceilings scheduled for
4 removal.
- 5 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK
- 6 A. Demolish and extend existing electrical work under provisions of Division 1 of
7 Specifications and this Section.
- 8 B. Remove, relocate, and extend existing installations to accommodate new construction.
- 9 C. Remove abandoned wiring and raceway to source of supply. Existing conduit in good
10 condition may be reused in place by including an equipment ground conductor in reused
11 conduit. Reused conduit and boxes shall have supports revised to meet current codes.
12 Relocating conduit shall not be allowed.
- 13 D. Remove exposed abandoned raceway, including abandoned raceway above accessible
14 ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all
15 associated clamps, hangers, supports, etc. associated with raceway removal.
- 16 E. Disconnect and remove outlets and devices that are to be demolished. Remove outlet or
17 devices' associated back box, supports, and conduit and conductors back to source. Patch
18 opening created from removal of device to match surrounding finishes, matching cover
19 plate material specified on project material list.
- 20 F. Disconnect and remove abandoned panelboards and distribution equipment.
- 21 G. Disconnect and remove electrical devices and equipment serving utilization equipment that
22 has been removed.
- 23 H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and
24 other accessories. Ballasts in light fixtures installed prior to 1980 shall be incinerated in
25 EPA approved incinerator or disposed of in EPA certified containers and deposited in an
26 EPA landfill certified for PCB disposal or recycled by permitted ballast recycler.
27 Punctured or leaking ballasts must be disposed of according to Federal Regulations under
28 the Toxic Substance Control Act. Provide Owner and Architect/Engineer with a Certificate
29 of Destruction to verify proper disposal.
- 30 I. Repair adjacent construction and finishes damaged during demolition and extension work.
31 Patch openings to match existing surrounding finishes.
- 32 J. Maintain access to existing electrical installations that remain active. Modify installation
33 or provide junction boxes and access panel as appropriate.
- 34 K. Extend existing installations using materials and methods compatible with existing
35 electrical installations, or as specified. Extended conduit and conductors to match existing
36 size and material.
- 37 L. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure
38 (TCLP), to be hazardous waste shall be disposed of in an EPA-permitted hazardous waste
39 disposal facility or by a permitted lamp recycler.
- 40 M. Regulatory Requirements: Comply with governing EPA notification regulations before
41 beginning demolition. Comply with hauling and disposal regulations of authorities having
42 jurisdiction.

1 N. Floor slabs may contain conduit systems. This Contractor is responsible for taking any
2 measures required to ensure no conduits or other services are damaged. This includes x-ray
3 or similar non-destructive means. Where conduit is in concrete slab, cut conduit flush with
4 floor, pull out conductors, and plug conduit ends.

5 O. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of
6 any cables, conduits, or other services if damaged without proper investigation.

7 3.4 CLEANING AND REPAIR

8 A. Clean and repair existing materials and equipment that remain or are to be reused.

9 B. Panelboards: Clean exposed surfaces and check tightness of electrical connections.
10 Replace damaged circuit breakers and provide closure plates for vacant positions. Provide
11 typed circuit directory showing revised circuiting arrangement.

12 C. Luminaires: Remove existing luminaires for cleaning as indicated on the drawings. Use
13 mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe
14 dry. Replace lamps and broken electrical parts. Replacement parts shall match specified
15 components for new luminaires of same type when applicable. Reinstall luminaire and
16 connect to circuiting as indicated on drawings.

17 D. ELECTRICAL ITEMS (E.G., LIGHTING FIXTURES, RECEPTACLES, SWITCHES,
18 CONDUIT, WIRE, ETC.) REMOVED AND NOT RELOCATED REMAIN THE
19 PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED
20 BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE
21 CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL
22 THE OWNER DOES NOT WANT.

23 3.5 INSTALLATION

24 A. Install relocated materials and equipment under the provisions of Division 1 of
25 Specifications.

26 END OF SECTION

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SECTION 26 05 13 - WIRE AND CABLE

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Building wire
- 5 B. Remote control and signal cable

6 1.2 REFERENCES

- 7 A. NEMA WC 70 - Power Cables Rated 2,000V or Less for the Distribution of Electrical
- 8 Energy
- 9 B. UL 44 – Thermoset-Insulated Wires and Cables
- 10 C. UL 83 – Thermoplastic-Insulated Wires and Cables
- 11 D. UL 854 – Service-Entrance Cables
- 12 E. UL 1581 – Standard for Electrical Wires, Cables, and Flexible Cords

13 **PART 2 - PRODUCTS**

14 2.1 BUILDING WIRE

- 15 A. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt
- 16 insulation, THHN/THWN or XHHW-2.
- 17 B. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation,
- 18 THHN/THWN. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded
- 19 conductor, unless otherwise noted on the drawings.
- 20 C. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THWN.
- 21 D. Each 120 and 277 volt branch circuit shall have a dedicated neutral conductor. Neutral
- 22 conductors shall be considered current-carrying conductors for wire derating.

23 2.2 REMOTE CONTROL AND SIGNAL CABLE

- 24 A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt
- 25 insulation, rated 60°C, individual conductors twisted together, shielded, and covered with a
- 26 PVC jacket.
- 27 B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper
- 28 conductor, 300 volt insulation, rated 60°C, individual conductors twisted together, shielded,
- 29 and covered with a PVC jacket; UL listed.
- 30 C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper
- 31 conductor, 300 volt insulation, rated 60°C, individual conductors twisted together,
- 32 shielded, and covered with a nonmetallic jacket; UL listed for use in air handling ducts,
- 33 hollow spaces used as ducts, and plenums.

1 **PART 3 - EXECUTION**

2 3.1 WIRE AND CABLE INSTALLATION SCHEDULE

- 3 A. Above Accessible Ceilings: Building wire in raceways. Low voltage cable (less than 100
4 volts) may be installed without conduit. Low voltage cables in ducts, plenums and other
5 air-handling spaces shall be plenum listed.
- 6 B. All Other Locations: Building wire in raceway.
- 7 C. Above Grade: All conductors installed above grade shall be type “THHN”.

8 3.2 CONTRACTOR CHANGES

- 9 A. The Contractor shall be responsible for derating and sizing conductors and conduits to
10 equal or exceed the ampacity of the basis of design circuits, if he/she chooses to use
11 methods or materials other than the basis of design.
- 12 B. Record drawing shall include the calculations and sketches.

13 3.3 GENERAL WIRING METHODS

- 14 A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14
15 AWG for control wiring.
- 16 B. Use no wire smaller than 18 AWG for low voltage control wiring (<100 volts).
- 17 C. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75
18 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.
- 19 D. Use no wire smaller than 8 AWG for outdoor lighting circuits.
- 20 E. The ampacity of multiple conductors in one conduit shall be derated per National Electrical
21 Code, Article 310. In no case shall more than 4 conductors be installed in one conduit to
22 such loads as motors larger than 1/4 HP, panelboards, motor control centers, etc.
- 23 F. Splice only in junction or outlet boxes.
- 24 G. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- 25 H. Make conductor lengths for parallel circuits equal.
- 26 I. All conductors shall be continuous in conduit from last outlet to their termination.
- 27 J. Terminate all spare conductors on terminal blocks, and label the spare conductors.
- 28 K. Cables or wires shall not be laid out on the ground before pulling.
- 29 L. Cables or wires shall not be dragged over earth or paving.
- 30 M. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that
31 would cause damage to the wire and cable.
- 32 N. At least six (6)-inch loops or ends shall be left at each outlet for installation connection of
33 luminaires or other devices.
- 34 O. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up,
35 spliced if continuity of circuit is required, and insulated.

1 3.4 WIRING INSTALLATION IN RACEWAYS

- 2 A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant
3 for pulling 4 AWG and larger wires.
- 4 B. Install wire in raceway after interior of building has been physically protected from the
5 weather and all mechanical work likely to injure conductors has been completed.
- 6 C. Pulling shall be continuous without unnecessary stops and starts with wire or cable only
7 partially thru raceway.
- 8 D. Where reels of cable or wire are used, they shall be set up on jacks close to the point where
9 the wire or cable enters the conduit or duct so that the cable or wire may be unreeled and
10 run into the conduit or duct with a minimum of change in the direction of the bend.
- 11 E. Conductors shall not be pulled through conduits until plastering or masonry work is
12 completed and conduits are free from moisture. Care shall be taken so that long pulls of
13 wire or pulls around several bends are not made where the wire may be permanently
14 stretched and the insulation damaged.
- 15 F. Only nylon rope shall be permitted to pull cables into conduit and ducts.
- 16 G. Completely and thoroughly swab raceway system before installing conductors.
- 17 H. Conductor Supports in Vertical Raceways:
- 18 1. Support conductors in vertical raceways in accordance with NEC 300.19 and
19 Table 300.19(A) Spacing of Conductors Supports.
- 20 2. Supports shall be of insulated wedge type (OZ Gedney Type S, or equal) and
21 installed in a tapered insulated bushing fitting or a metal woven mesh with a
22 support ring that fits inside conduit fitting installed in an accessible junction box
23 (Hubbell Kellems support grip or equal).

24 3.5 WIRING CONNECTIONS AND TERMINATIONS

- 25 A. Splice and tap only in accessible junction boxes.
- 26 B. Use solderless, tin-plated copper, compression terminals (lugs) applied with
27 circumferential crimp for copper conductor terminations, 8 AWG and larger.
- 28 C. Use solderless, tin-plated, compression terminals (lugs) applied with indenter crimp for
29 copper conductor terminations, 10 AWG and smaller.
- 30 D. Use solderless pressure connectors with insulating covers for copper wire splices and taps,
31 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with
32 plastic caps.
- 33 E. Use copper, compression connectors applied with circumferential crimp for copper wire
34 splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with
35 electrical tape to 150 percent of the insulation value of conductor.
- 36 F. Thoroughly clean wires before installing lugs and connectors.
- 37 G. Make splices, taps and terminations to carry full ampacity of conductors without
38 perceptible temperature rise.

- 1 H. Phase Sequence: All apparatus shall be connected to operate in the phase sequence A-B-C
2 representing the time sequence in which the phase conductors so identified reach positive
3 maximum voltage.
- 4 I. As a general rule, applicable to switches, circuit breakers, starters, panelboards, switchgear
5 and the like, the connections to phase conductors are intended thus:
- 6 1. Facing the front and operating side of the equipment, the phase identification shall
7 be:
- 8 a. Left to Right - A-B-C
9 b. Top to Bottom - A-B-C
- 10 J. Connection revisions as required to achieve correct rotation of motors shall be made at the
11 load terminals of the starters or disconnect switches.

12 3.6 FIELD QUALITY CONTROL

- 13 A. Field inspection and testing will be performed under provisions of Division 1.
- 14 B. Building Wire and Power Cable Testing: Test shall be made by means of an insulation
15 testing device such as a "Megger" using not less than 500 volts D.C. test potential.
- 16 C. Inspect wire and cable for physical damage and proper connection.
- 17 D. Torque test conductor connections and terminations to manufacturers recommended values.
- 18 E. Perform continuity test on all power and equipment branch circuit conductors. Verify
19 proper phasing connections.

20 END OF SECTION

1

SECTION 26 05 26 - GROUNDING AND BONDING

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

4 A. Equipment grounding system

5 1.2 QUALITY ASSURANCE

6 A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA
7 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and
8 marked for intended use.

9 B. Comply with UL 467 Grounding and Bonding Equipment.

10 C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

11 D. Comply with NFPA 70; for overhead-line construction and medium-voltage underground
12 construction, comply with IEEE/ANSI C2 National Electrical Safety Code (NESC).

13 1.3 SUMMARY

14 A. This section includes grounding of electrical systems and equipment. Grounding
15 requirements specified in this Section may be supplemented by special requirements of
16 systems described in other Sections.

17 **PART 2 - PRODUCTS**

18 2.1 GROUNDING CONDUCTORS

19 A. For insulated conductors, comply with Division 26 Section 26 05 13 "Wire and Cable".

20 B. Material: Copper.

21 C. Equipment Grounding Conductors: Insulated with green-colored insulation.

22 **PART 3 - EXECUTION**

23 3.1 CONNECTIONS

24 A. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-
25 type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated
26 with winged pressure-type connectors.

27 B. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal
28 housings without mechanical and electrical connection to housing, terminate each conduit
29 with a grounding bushing. Connect grounding bushings with a bare grounding conductor
30 to grounding bus or terminal in housing. Bond electrically non-continuous conduits at
31 entrances and exits with grounding bushings and bare grounding conductors, unless
32 otherwise indicated.

33 3.2 INSTALLATION

34 A. In raceways, use insulated equipment grounding conductors.

1 3.3 EQUIPMENT GROUNDING SYSTEM

2 A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment
3 grounding conductors, unless specific types, larger sizes, or more conductors than required
4 by NFPA 70 are indicated.

5 B. Install equipment grounding conductors in all feeders and circuits. Terminate each end on a
6 grounding lug or bus.

7 3.4 FIELD QUALITY CONTROL

8 A. Inspect grounding and bonding system conductors and connections for tightness and proper
9 installation.

10 END OF SECTION

1

SECTION 26 05 33 - CONDUIT AND BOXES

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Rigid metallic conduit and fittings
- 5 B. Intermediate metallic conduit and fittings
- 6 C. Electrical metallic tubing and fittings
- 7 D. Flexible metallic conduit and fittings
- 8 E. Liquidtight flexible metallic conduit and fittings
- 9 F. Rigid polyvinyl chloride conduit and fittings
- 10 G. Wall and ceiling outlet boxes
- 11 H. Electrical connection
- 12 I. Pull and junction boxes
- 13 J. Accessories

14 1.2 REFERENCES

- 15 A. American National Standards Institute (ANSI):
 - 16 1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
 - 17 2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated and Fittings
 - 18 3. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
 - 19 4. ANSI C80.6 - Intermediate Metal Conduit, Zinc Coated
 - 20 5. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box
 - 21 Supports
 - 22 6. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box
 - 23 Supports
- 24 B. Federal Specifications (FS):
 - 25 1. A-A-50553A - Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall
 - 26 (EMT) Type
 - 27 2. A-A-55810 - Specification for Flexible Metal Conduit
- 28 C. NECA "Standards of Installation"
- 29 D. National Electrical Manufacturers Association (NEMA):
 - 30 1. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit,
 - 31 Electrical Metallic Tubing and Cable
 - 32 2. RN 1 - Polyvinyl chloride (PVC) Externally Coated Galvanized Rigid Steel
 - 33 Conduit and Intermediate Metal Conduit
 - 34 3. TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit
 - 35 4. TC 9 - Fittings for PVC Plastic Utilities Duct for Underground Installation
- 36 E. National Fire Protection Association (NFPA):
 - 37 1. ANSI/NFPA 70 - National Electrical Code
- 38 F. Underwriters Laboratories (UL): Applicable Listings
 - 39 1. UL 1 - Flexible Metal Conduit
 - 40 2. UL 6 - Rigid Metal Conduit
 - 41 3. UL 360 - Liquid Tight Flexible Steel Conduit
 - 42 4. UL514-B - Conduit Tubing and Cable Fittings
 - 43 5. UL651-A - Type EB and a PVC Conduit and HDPE Conduit

- 1 6. UL651-B – Continuous Length HDPE Conduit
- 2 7. UL746A – Standard for Polymeric Materials – Short Term Property Evaluations
- 3 8. UL797 – Electrical Metal Tubing
- 4 9. UL1242 – Intermediate Metal Conduit

5 G. Definitions:

- 6 1. Fittings: Conduit connection or coupling.
- 7 2. Body: Enlarged fittings with opening allowing access to the conductors for
8 pulling purposes only.
- 9 3. Mechanical Spaces: Enclosed areas, usually kept separated from the general
10 public, where the primary use is to house service equipment and to route services.
11 These spaces generally have exposed structures, bare concrete and
12 non-architecturally emphasized finishes.
- 13 4. Finished Spaces: Enclosed areas where the primary use is to house personnel and
14 the general public. These spaces generally have architecturally emphasized
15 finishes, ceilings and/or floors.
- 16 5. Concealed: Not visible by the general public. Often indicates a location either
17 above the ceiling, in the walls, in or beneath the floor slab, in column coverings,
18 or in the ceiling construction.
- 19 6. Above Grade: Not directly in contact with the earth. For example, an interior wall
20 located at an elevation below the finished grade shall be considered above grade
21 but a wall retaining earth shall be considered below grade.
- 22 7. Slab: Horizontal pour of concrete used for the purpose of a floor or sub-floor.

23 **PART 2 - PRODUCTS**

24 2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

25 A. Acceptable Manufacturers:

- 26 1. Acceptable Manufacturers: Allied, LTV, Steelduct, Wheatland Tube Co, O-Z
27 Gedney, or approved equal.
- 28 2. Acceptable Manufacturers of RMC Conduit Fittings: Appleton Electric,
29 O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas &
30 Betts, Crouse-Hinds, Killark, or approved equal.

31 B. Minimum Size Galvanized Steel: 3/4 inch (19mm), unless otherwise noted.

32 C. Fittings and Conduit Bodies:

- 33 1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with
34 provisions for mounting to form.
- 35 2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of
36 4 inches of movement. Fitting shall be watertight with an insulating bushing and
37 a bonding jumper.
- 38 3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end
39 coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings
40 shall be watertight and concrete-tight.

1 4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic
2 thermosetting insulation. Where required elsewhere in the contract documents,
3 bushing shall be complete with ground conductor saddle and clamp. **High impact**
4 **phenolic threaded type bushings are not acceptable.**

5 5. All other fittings and conduit bodies shall be of malleable iron construction and
6 hot dip galvanized.

7 2.2 INTERMEDIATE METALLIC CONDUIT (IMC) AND FITTINGS

8 A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

9 B. Acceptable Manufacturers: Allied, LTV, Steelduct, Wheatland Tube Co, O-Z Gedney, or
10 approved equal.

11 C. Fittings and Conduit Bodies:

12 1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with
13 provisions for mounting to form.

14 2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of
15 4 inches of movement. Fitting shall be watertight with an insulating bushing and a
16 bonding jumper.

17 3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end
18 coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings
19 shall be watertight and concrete-tight.

20 4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic
21 thermosetting insulation. Where required elsewhere in the contract documents,
22 bushing shall be complete with ground conductor saddle and clamp. **High impact**
23 **phenolic threaded type bushings are not acceptable.**

24 5. All other fittings and conduit bodies shall be of malleable iron construction and
25 hot dip galvanized.

26 2.3 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

27 A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.

28 B. Acceptable Manufacturers of EMT Conduit: Allied, LTV, Steelduct, Wheatland Tube Co,
29 or approved equal.

30 C. Fittings and Conduit Bodies:

31 1. 2" Diameter or Smaller: Compression or steel set screw type of steel designed for
32 their specific application.

33 2. Larger than 2": Compression or steel set screw type of steel designed for their
34 specific application.

35 3. Acceptable Manufacturers of EMT Conduit Fittings: Appleton Electric,
36 O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas &
37 Betts, or approved equal.

1 2.4 FLEXIBLE METALLIC CONDUIT (FMC) AND FITTINGS

- 2 A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted. Lighting branch circuit
3 wiring to an individual luminaire may be a manufactured, UL listed 3/8" flexible metal
4 conduit with #14 AWG THHN conductors and an insulated ground wire.
- 5 B. Acceptable Manufacturers: American Flex, Alflex, Electri-Flex Co, or approved equal.
- 6 C. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type
7 formed from a continuous length of spirally wound, interlocked zinc coated strip steel.
8 Provide a separate equipment grounding conductor when used for equipment where
9 flexibility is required.
- 10 D. Fittings and Conduit Bodies:
- 11 1. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable
12 cast iron or screw-in type, die-cast zinc.
- 13 2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by
14 the manufacturer to protect conductors from sharp edges.
- 15 3. Acceptable Manufacturers: O-Z/Gedney Co., Thomas & Betts, Appleton Electric,
16 Electroline, Bridgeport, Midwest, Regal, or approved equal.

17 2.5 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC) AND FITTINGS

- 18 A. Acceptable Manufacturers: Anaconda Type UA, Electri-Flex Type LA, Alflex, Carlon
19 (Lamson & Sessions), or approved equal.
- 20 B. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type
21 formed from a continuous length of spirally wound, interlocked zinc coated strip steel and
22 an extruded PVC cover.
- 23 C. Fittings and Conduit Bodies:
- 24 1. Watertight, compression type, galvanized zinc coated cadmium plated malleable
25 cast iron, UL listed.
- 26 2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by
27 the manufacturer to protect conductors from sharp edges.
- 28 3. Acceptable Manufacturers: Appleton Electric, O-Z/Gedney Co., Electroline,
29 Bridgeport, Thomas & Betts, Midwest, Regal, Carlon (Lamson & Sessions), or
30 approved equal.

31 2.6 RIGID NON-METALLIC CONDUIT (PVC) AND FITTINGS

- 32 A. Minimum Size Rigid Smooth-Wall Nonmetallic Conduit: 3/4 inch, unless otherwise noted.
- 33 B. Acceptable Manufacturers: Carlon (Lamson & Sessions) Type 40, Cantex, J.M. Mfg., or
34 approved equal.
- 35 C. Construction: Schedule 40 and Schedule 80 rigid polyvinyl chloride (PVC), UL labeled for
36 90°C.
- 37 D. Fittings and Conduit Bodies: NEMA TC 3; sleeve type suitable for and manufactured
38 especially for use with the conduit by the conduit manufacturer.

1 E. Plastic cement for joining conduit and fittings shall be provided as recommended by the
2 manufacturer.

3 2.7 OUTLET BOXES

4 A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, minimum of 14 gauge,
5 with 1/2 inch male fixture studs where required.

6 B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

7 C. Cast Boxes: NEMA FB1, Type FD, Aluminum or cast ferrous alloy, deep type, gasketed cover,
8 threaded hubs.

9 D. Outlet boxes for luminaires to be not less than 1-1/2" deep, deeper if required by the
10 number of wires or construction. The box shall be coordinated with surface luminaires to
11 conceal the box from view or provide a finished trim plate.

12 E. Switch outlet boxes for local light control switches, dimmers and occupancy sensors shall
13 be 4 inches square by 2-1/8 inches deep, with raised cover to fit flush with finish wall line.
14 Multiple gang switch outlets shall consist of the required number of gang boxes appropriate
15 to the quantity of switches comprising the gang. Where walls are plastered, provide a
16 plaster raised cover. Where switch outlet boxes occur in exposed concrete block walls,
17 boxes shall be installed in the block cavity with a raised square edge tile cover of sufficient
18 depth to extend out to face of block or masonry boxes.

19 F. Outlet boxes for telephone substations in walls and columns shall be 4 inches square and
20 2-1/8 inches deep with single gang raised cover to fit flush with finished wall line equipped
21 with flush telephone plate.

22 G. Wall or column receptacle outlet boxes shall be 4 inches square with raised cover to fit
23 flush with finished wall line. Boxes in concrete block walls shall be installed the same as
24 for switch boxes in block walls.

25 2.8 [ECONN]: ELECTRICAL CONNECTION

26 A. Electrical connection to equipment and motors, sized per NEC. Coordinate requirements
27 with contractor furnishing equipment or motor. Refer to specifications and general
28 installation notes for terminations to motors.

29 2.9 ACCESSORIES

30 A. Fire Rated Moldable Pads: UL #9700, moldable sheet putty at required thickness on all
31 five sides of back boxes. Kinetics Noise Control – IsoBacker Pad, SpecSeal – SSP Putty
32 and Pads, 3M #MPP-4S or equal.

33 B. Sound Barrier Insulation Pads: Mastic, non-hardening, sheet material, minimum 1/8"
34 thickness applied to all five sides of back boxes. Kinetics Noise Control – SealTight
35 Backer Pad, L.H. DOTTIE Co., #68 or equal.

36 **PART 3 - EXECUTION**

37 3.1 CONDUIT SIZING

38 A. Size conduit as shown on the drawings and specifications. Where not indicated in the
39 contract documents, conduit size shall be according to N.E.C. (Latest Edition). Conduit and
40 conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain
41 conductor ampere capacity as required by the National Electrical Code (to include enlarged

1 conductors due to temperature and quantity derating values) and to prevent excessive
2 voltage drop and pulling tension due to long conduit/conductor lengths.

3 B. Minimum Conduit Size (Unless Noted Otherwise):

4 1. Above Grade: 3/4 inch. (The use of 1/2 inch would be allowed for installation
5 conduit to individual light switches, individual receptacles and individual fixture
6 whips from junction box.)

7 2. Controls Conduit: 1/2 inch.

8 C. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically
9 noted on the drawings.

10 3.2 CONDUIT ARRANGEMENT

11 A. In general, conduit shall be installed concealed in walls, in finished spaces and where
12 possible or practical, or as noted otherwise. In unfinished spaces, mechanical and utility
13 areas, conduit may run either concealed or exposed as conditions dictate and as practical
14 unless noted otherwise on drawings. Installation shall maintain headroom in exposed
15 vicinities of pedestrian or vehicular traffic.

16 B. Conduit shall not share the same cell as structural reinforcement in masonry walls.

17 C. Conduit runs shall be routed as shown on large scale drawings. Conduit routing on
18 drawings scaled 1/4"=1'-0" or less shall be considered diagrammatic, unless noted
19 otherwise. The correct routing, when shown diagrammatically shall be chosen by the
20 Contractor based on information in the contract documents, in accordance with
21 manufacturer's written instructions, applicable codes, the NECA's "Standard of
22 Installation", in accordance with recognized industry standards, and coordinated with other
23 contractors.

24 D. Contractor shall adapt his work to the job conditions and make such changes as required
25 and permitted by the Architect/Engineer, such as moving to clear beams and joists,
26 adjusting at columns, avoiding interference with windows, etc., to permit the proper
27 installation of other mechanical and/or electrical equipment.

28 E. Contractor shall cooperate with all Contractors on the project. He shall obtain details of
29 other Contractor's work in order to ensure fit and avoid conflict. Any expense due to the
30 failure of This Contractor to do so shall be paid for in full by him. The other trades
31 involved as directed by the Architect/Engineer shall perform the repair of work damaged as
32 a result of neglect or error by This Contractor. The resultant costs shall be borne by This
33 Contractor.

34 3.3 CONDUIT SUPPORT

35 A. Conduit runs installed above a suspended ceiling shall be properly supported. In no case
36 shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system
37 for conduit support.

38 B. Conduit shall not be supported from ductwork, water, sprinkler piping, or other non-
39 structural members, unless approved by the Architect/Engineer. All supports shall be from
40 structural slabs, walls, structural members, and bar joists, and coordinated with all other
41 applicable contractors, unless noted otherwise.

42 C. Conduit shall be held in place by the correct size of galvanized one-hole conduit clamps,
43 two-hole conduit straps, patented support devices, clamp back conduit hangers, or by other
44 means if called for on the drawings.

- 1 D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or
2 clamps.
- 3 E. Spring-steel conduit clips specifically designed for supporting single conduits or tubing
4 may be used in lieu of malleable-iron hangers for 1" and smaller raceways serving lighting
5 and receptacle branch circuits above accessible ceilings and for securing raceways to
6 slotted channel and angle supports.
- 7 F. Group conduits in parallel runs where practical and use conduit racks or trapeze hangers
8 constructed of steel channel, suspended with threaded solid rods or wall mounted from
9 metal channels with conduit straps or clamps. Provide space in each rack or trapeze for
10 25% additional conduits.
- 11 G. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when
12 attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and
13 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the
14 hanger restrictions cannot be achieved, supplemental framing off steel framing will need to
15 be added.
- 16 H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is
17 carried entirely by raceway supports, with no weight load on raceway terminals.
- 18 I. Supports for metallic conduit shall be no greater than 10 feet. A smaller interval may be
19 used if necessitated by building construction, but in no event shall support spans exceed the
20 National Electrical Code requirements. Conduit shall be securely fastened within 3 feet of
21 each outlet box, junction box, device box, cabinet, or fitting.
- 22 J. Supports of flexible conduit shall be within 12 inches of each outlet box, junction box,
23 device box, cabinet, or fitting and at intervals not to exceed 4.5 feet.
- 24 K. Supports for non-metallic conduit shall be at sufficiently close intervals to eliminate any
25 sag in the conduit. The manufacturer's recommendations shall be followed, but in no event
26 shall support spans exceed the National Electrical Code requirements.
- 27 L. Where conduit is to be installed in poured concrete floors or walls, provide concrete-tight
28 conduit inserts securely fastened to forms to prevent conduit misplacement.
- 29 M. Finish:
- 30 1. Prime coat exposed steel hangers and supports. Hangers and supports in crawl
31 spaces, pipe shafts, and above suspended ceiling spaces are not considered
32 exposed.
- 33 2. Trim all ends of exposed field fabricated steel hangers, slotted channel and
34 threaded rod to within 1" of support or fastener to eliminate potential injury to
35 personnel unless shown otherwise on the drawings. Smooth ends and install
36 elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6"
37 of finish floor and presents potential injury to personnel.
- 38 3.4 CONDUIT INSTALLATION
- 39 A. Conduit Connections:
- 40 1. Shorter than standard conduit lengths shall be cut square using industry standards.
41 The ends of all conduits cut shall be reamed or otherwise finished to remove all
42 rough edges.
- 43 2. Metallic conduit connections in slab on grade installation shall be sealed and one
44 coat of rust inhibitor primer applied after the connection is made.

- 1 3. Where conduits with tapered threads cannot be coupled with standard couplings,
2 then approved split or Erickson couplings shall be used. Running threads will not
3 be permitted.
- 4 4. Install expansion/deflection joints where conduit crosses structure
5 expansion/seismic joints.
- 6 B. Conduit terminations for all low voltage wiring shall have nylon bushings installed on each
7 end of every conduit run.
- 8 C. Conduit Bends:
- 9 1. Use a hydraulic one-shot conduit bender or factory elbows for bends in conduit 2"
10 in size or larger. All steel conduit bending shall be done cold; no heating of steel
11 conduit shall be permitted.
- 12 2. All bends of rigid polyvinyl chloride conduit (PVC) shall be made with the
13 manufacturer's approved bending equipment. The use of spot heating devices will
14 not be permitted (i.e. blow torches).
- 15 3. A run of conduit shall not contain more than the equivalent of four (4) quarter
16 bends (360°), including those bends located immediately at the outlet or body.
- 17 4. Rigid polyvinyl chloride conduit (PVC) runs longer than 100 feet or runs which
18 have more than two 90° equivalent bends (regardless of length) shall use rigid
19 metal or RTRC factory elbows for bends.
- 20 5. Use conduit bodies to make sharp changes in direction (i.e. around beams).
- 21 D. Conduit Placement:
- 22 1. Conduit shall be mechanically continuous from source of current to all outlets.
23 Conduit shall be electrically continuous from source of current to all outlets,
24 unless a properly sized grounding conductor is routed within the conduit. All
25 metallic conduits shall be bonded per the National Electrical Code.
- 26 2. Route exposed conduit and conduit above suspended ceilings (accessible or not)
27 parallel/perpendicular to the building structural lines, and as close to building
28 structure as possible. Wherever possible, route horizontal conduit runs above
29 water and steam piping.
- 30 3. Route conduit through roof openings provided for piping and ductwork where
31 possible. If not provided or routing through provided openings is not possible,
32 route through roof jack with pitch pocket. Coordinate roof penetrations with other
33 trades.
- 34 4. Conduits, raceway, and boxes shall not be installed in concealed locations in metal
35 deck roofing or less than 1.5" below bottom of roof decking.
- 36 5. Avoid moisture traps where possible. Where unavoidable, provide a junction box
37 with drain fitting at conduit low point.
- 38 6. All conduits through walls shall be grouted or sealed into openings. Where
39 conduit penetrates firewalls and floors, seal with a UL listed sealant. Seal
40 penetrations with intumescent caulk, putty, or sheet installed per manufacturer's
41 recommendations. All materials used to seal penetrations of firewalls and floors
42 shall be tested and certified as a system per ASTM E814 Standard for fire tests or
43 through-penetration fire stops as manufactured by 3M or approved equal.

- 1 7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS
2 REQUIRED IN MASONRY OR EXTERIOR WALLS UNDER THIS
3 DIVISION. A QUALIFIED MASON AT THE EXPENSE OF THIS
4 CONTRACTOR SHALL REPAIR ALL OPENINGS TO MATCH EXISTING
5 CONDITIONS.
- 6 8. Seal interior of conduit at exterior entries, air handling units, coolers/freezers, etc.,
7 and where the temperature differential can potentially be greater than 20°F, to
8 prevent moisture penetration. Seal shall be placed where conduit enters warm
9 space. Conduit seal fitting shall be a drain/seal, with sealing compound, equal to
10 O-Z/Gedney type EYD.
- 11 9. Rigid polyvinyl chloride conduit (PVC) shall be installed when material surface
12 temperatures and ambient temperature are greater than 40°F.
- 13 10. Where rigid polyvinyl chloride conduit (PVC) is used below grade, in a slab,
14 below a slab, etc., a transition to rigid galvanized steel or PVC-coated steel
15 conduit shall be installed before conduit exits earth. The metallic conduit shall
16 extend a minimum of 6" into the surface concealing the non-metallic conduit.
- 17 11. Contractor shall provide suitable mechanical protection around all conduits
18 stubbed out from floors, walls or ceilings during construction to prevent bending
19 or damaging of stubs due to carelessness with construction equipment.
- 20 12. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength
21 in each empty conduit (indoor and outdoor), except in sleeves and nipples.

22 3.5 CONDUIT TERMINATIONS

- 23 A. Where conduit bonding is indicated or required in the contract documents, the bushings
24 shall be a grounding type sized for the conduit and ground bonding conductor as
25 manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, or approved
26 equal.
- 27 B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and
28 one (1) lock nut and bushing on the inside of each box.
- 29 C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with
30 lock nuts and provided with approved screw type tinned iron bushings or fittings with
31 plastic inserts.
- 32 D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be
33 tightly screwed against the shoulder portion of the threaded openings.
- 34 E. Conduit terminations to all motors shall be made with flexible metallic conduit (FMC),
35 unless noted otherwise. Final connections to roof exhaust fans, or other exterior motors and
36 motors in damp or wet locations shall be made with liquidtight flexible metallic conduit
37 (LFMC). Motors in hazardous areas, as defined in the National Electrical Code, shall be
38 connected using flexible conduit rated for the environment. Flexible conduit shall not
39 exceed 6' in length. Route equipment ground conductors from circuit ground to motor
40 ground terminal through flexible conduit.
- 41 F. Rigid polyvinyl chloride conduit (PVC) shall be terminated using fittings and bodies
42 produced by the manufacturer of the conduit, unless noted otherwise. Prepare conduit as
43 per manufacturer's recommendations before joining. All joints shall be solvent welded by
44 applying full even coat of plastic cement to the entire areas that will be joined. Turn the
45 conduit at least a quarter to one half turn in the fitting and let the joint cure for 1-hour
46 minimum or as per the manufacturer's recommendations.

1 G. All conduit ends shall be sealed with plastic immediately after installation to prevent the
2 entrance of any foreign matter during construction. The seals shall be removed and the
3 conduits blown clear of any and all foreign matter prior to any wires or pull cords being
4 installed.

5 3.6 CONDUIT INSTALLATION SCHEDULE

6 A. In the event the location of conduit installation represents conflicting installation
7 requirements as specified in the following schedule, a clarification shall be obtained from
8 the Architect/Engineer. If This Contractor is unable to obtain a clarification as outlined
9 above, concealed rigid galvanized steel conduit installed per these specifications and the
10 National Electrical Code shall be required.

11 B. The following schedule shall be adhered to unless they constitute a violation of applicable
12 codes or are noted otherwise on the drawings. The installation of RMC conduit will be
13 permitted in place of any and all conduit specified in this schedule.

14 1. Exposed:

15 a. Switchboards, panel feeders, etc.: EMT.

16 b. Branch Circuits (lighting, receptacles, controls, etc.): EMT.

17 c. Mechanical Equipment Feeders (pumps, AHU's, chillers, etc.): EMT.

18 d. Floor Mounted Pump Feeders: EMT with no more than 6' of PVC
19 coated flexible metal conduit to pump.

20 e. Controls: EMT painted blue or dyed blue.

21 2. Finished Spaces/Concealed: EMT.

22 3. Wet or Damp Locations: RMC conduit, boxes and fittings, installed and equipped
23 so as to prevent water from entering the conduit system.

24 4. Interior Locations:

25 a. Exposed: EMT conduit.

26 1) Exposed Controls Conduit: EMT painted blue or dyed blue.

27 b. Concealed: EMT.

28 5. Hazardous Locations as Defined by the National Electrical Code: RMC conduit
29 complete with screwed fittings and conduit seals.

30 3.7 BOX INSTALLATION SCHEDULE

31 A. Galvanized steel boxes may be used in:

32 1. Concealed interior locations above ceilings and in hollow studded partitions.

33 2. Exposed interior locations in mechanical rooms and in rooms without ceilings;
34 higher than 8' above the highest platform level.

35 3. Direct contact with concrete except slab on grade.

36 4. Recessed in stud wall of kitchens and laundries.

- 1 B. Cast boxes shall be used in:
- 2 1. Exterior locations.
- 3 2. Hazardous locations.
- 4 3. Exposed interior locations within 8' of the highest platform level.
- 5 4. Direct contact with earth.
- 6 5. Direct contact with concrete in slab on grade.
- 7 6. Wet locations.
- 8 7. Kitchens and laundries when exposed on wall surface.

9 3.8 COORDINATION OF BOX LOCATIONS

- 10 A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire
11 pulling, equipment connections, and code compliance.
- 12 B. Electrical box locations shown on the Contract Drawings are approximate, unless
13 dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to
14 rough-in.
- 15 C. Locate and install boxes to allow access. Avoid interferences with ductwork, piping,
16 structure, equipment, etc. Where installation is inaccessible, provide access doors.
17 Coordinate locations and sizes of required access doors with the Architect/Engineer and
18 General Contractor.
- 19 D. Locate and install to maintain headroom and to present a neat appearance.
- 20 E. Coordinate locations with Heating Contractor to avoid baseboard radiation cabinets.

21 3.9 OUTLET BOX INSTALLATION

- 22 A. Do not install boxes back-to-back in walls.
- 23 1. Provide a minimum horizontal separation of 6 inches between boxes installed on
24 opposite sides of non-rated stud walls. When the minimum separation cannot be
25 maintained, install sound insulation pads on all five sides of the back box in
26 accordance with the manufacturer's instructions.
- 27 2. Provide a minimum horizontal separation of 24 inches between boxes installed on
28 opposite sides of fire-rated walls. When the minimum separation cannot be
29 maintained, install fire-rated moldable pads to all five sides of the back box to
30 maintain the fire rating of the wall. Install moldable pads in accordance with UL
31 listing for the specific product. Sound insulation pads are not acceptable for use in
32 fire-rated wall applications unless the product carries the necessary fire rating.
- 33 B. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall
34 assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound
35 Transmission Class (STC) rating.
- 36 C. The Contractor shall anchor switch and outlet box to wall construction so that it is flush
37 with the finished masonry, paneling, drywall, plaster, etc. The Contractor shall check the
38 boxes as the finish wall surface is being installed to assure that the box is flush. (Provide
39 plaster rings as necessary.)
- 40 D. Mount at heights shown or noted on the drawings or as generally accepted if not
41 specifically noted.
- 42 E. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate
43 masonry cutting to achieve neat openings for boxes.

- 1 F. Provide knockout closures for unused openings.
- 2 G. Support boxes independently of conduit.
- 3 H. Use multiple-gang boxes where more than one device are mounted together; do not use
4 sectional boxes. Provide barriers to separate wiring of different voltage systems.
- 5 I. Install boxes in walls without damaging wall insulation.
- 6 J. Coordinate mounting heights and locations of outlets mounted above counters, benches,
7 backsplashes, and below baseboard radiation.
- 8 K. Position outlets to locate luminaires as shown on reflected ceiling drawings.
- 9 L. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed
10 luminaire, to be accessible through luminaire ceiling opening.
- 11 M. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition
12 studs, accurately positioned to allow for surface finish thickness. Use stamped steel stud
13 bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush
14 ceiling outlet boxes.
- 15 N. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- 16 O. Provide cast outlet boxes in exterior locations and wet locations, and where exposed rigid
17 or intermediate conduit is used.
- 18 3.10 PULL AND JUNCTION BOX INSTALLATION
- 19 A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- 20 B. Support pull and junction boxes independent of conduit.
- 21 C. Do not install boxes back-to-back in walls.
- 22 1. Provide a minimum horizontal separation of 6 inches between boxes installed on
23 opposite sides of non-rated stud walls. When the minimum separation cannot be
24 maintained, install sound insulation pads on all five sides of the back box in
25 accordance with the manufacturer's instructions.
- 26 2. Provide a minimum horizontal separation of 24 inches between boxes installed on
27 opposite sides of fire-rated walls. When the minimum separation cannot be
28 maintained, install fire-rated moldable pads to all five sides of the back box to
29 maintain the fire rating of the wall. Install moldable pads in accordance with UL
30 listing for the specific product. Sound insulation pads are not acceptable for use in
31 fire-rated wall applications unless the product carries the necessary fire rating.
- 32 D. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall
33 assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound
34 Transmission Class (STC) rating.
- 35 3.11 EXPOSED BOX INSTALLATION
- 36 A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods,
37 or structural steel elements.
- 38 B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no
39 less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or
40 expansion shields and round head machine screws. Cast boxes shall not be drilled.

- 1 C. On steel structures, exposed boxes shall be supported to the steel member by drilling and
2 tapping the member and fastening the boxes by means of round head machine screws.
- 3 D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is
4 supported by beam clamps.
- 5 E. Boxes shall be fastened to wood structures by means of a minimum of two (2) wood screws
6 adequately large and long to properly support. (Quantity depends on size of box.)
- 7 F. Wood, plastic, or fiber plugs shall not be used for fastenings.
- 8 G. Explosive devices shall not be used unless specifically allowed.

9 END OF SECTION

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1 **SECTION 26 05 53 - ELECTRICAL IDENTIFICATION**

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Nameplates and tape labels
- 5 B. Wire and cable markers
- 6 C. Conductor color coding

7 1.2 REFERENCES

- 8 A. ANSI C2 – National Electrical Safety Code
- 9 B. NFPA 70 – National Electrical Code
- 10 C. ANSI A13.1 – Standard for Pipe Identification
- 11 D. ANSI Z535.4 – Standard for Product Safety Signs and Labels

12 **PART 2 - PRODUCTS**

13 2.1 ELECTRICAL IDENTIFICATION PRODUCTS

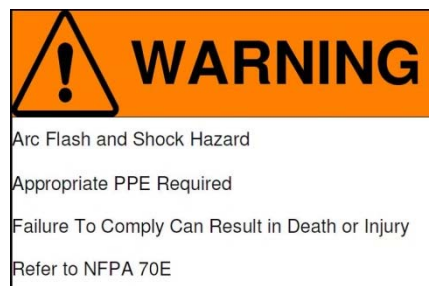
- 14 A. Colored Adhesive Marking Tape for banding Raceways, Wires, and Cables: Self-adhesive
15 vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- 16 B. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification:
17 flexible acrylic bands sized to suit the cable diameter and arranged to stay in place by pre-
18 tensioned gripping action when coiled around the cable.
- 19 C. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound,
20 cable/conductor markers with preprinted numbers and letter.
- 21 D. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-
22 inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range
23 from minus 50°F to 350°F. Provide ties in specified colors when used for color coding.
- 24 E. Indoor/Outdoor Number and Letters: Outdoor grade vinyl label, minimum of 3/4" high x
25 9/16" wide, with acrylic adhesive designed for permanent application in severe indoor and
26 outdoor environments.

27 **PART 3 - EXECUTION**

28 3.1 INSTALLATION

- 29 A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations
30 used in electrical identification work with corresponding designations specified or
31 indicated. Install numbers, lettering, and colors as required by code.
- 32 B. Install identification devices in accordance with manufacturer's written instruction and
33 requirements of NEC.
- 34 C. Sequence of Work: Where identification is to be applied to surfaces that require finish,
35 install identification after completion of finish work. All mounting surfaces shall be
36 cleaned and degreased prior to identification installation.

- 1 D. Identify Junction, Pull and Connection Boxes: Labeling shall be 3/8-inch Kroy tape or
2 Brother self-laminating vinyl label or permanent magic marker, neatly hand printed. In
3 rooms that are painted out, provide labeling on inside of cover.
- 4 E. Circuit Identification: Tag or label conductors as follows:
- 5 1. Multiple Power or Lighting Circuits in Same Enclosure: Where multiple branch
6 circuits are terminated or spliced in a box or enclosure, label each conductor with
7 source and circuit number.
- 8 2. Multiple Control Wiring and Communication/Signal Circuits in Same Enclosure:
9 For control and communications/signal wiring, use wire/cable marking tape at
10 terminations in wiring boxes, troughs, and control cabinets. Use consistent
11 letter/number conductor designations throughout on wire/cable marking tape.
- 12 3. Match identification markings with designations used in panelboards shop
13 drawings, Contract Documents, and similar previously established identification
14 schemes for the facility's electrical installations.
- 15 F. Apply warning, caution and instruction signs as follows:
- 16 1. Install warning, caution or instruction signs where required by NEC, where
17 indicated, or where reasonably required to assure safe operation and maintenance
18 of electrical systems and of the items to which they connect. Install engraved
19 plastic-laminated instruction signs with approved legend where instructions or
20 explanations are needed for system or equipment operation. Install metal-backed
21 butyrate signs for outdoor items.
- 22 2. Emergency Operating Signs: Install, where required by NEC, where indicated, or
23 where reasonably required to assure safe operation and maintenance of electrical
24 systems and of the items to which they connect, engraved laminate signs with
25 white legend on red background with minimum 3/8-inch high lettering for
26 emergency instructions on power transfer, load shedding, or other emergency
27 operations.
- 28 G. Apply circuit/control/item designation labels of engraved plastic laminate for pushbuttons,
29 pilot lights, alarm/signal components, and similar items, except where labeling is specified
30 elsewhere.
- 31 H. Install labels parallel to equipment lines at locations as required and at locations for best
32 convenience of viewing without interference with operation and maintenance of
33 equipment.
- 34 I. Install ARC FLASH WARNING signs on all switchboards, panelboards, industrial control
35 panels, and motor control centers. Sign at a minimum shall contain:



36

- 1 J. Circuits with more than 600V: Identify raceway and cable with "DANGER—HIGH
2 VOLTAGE" in black letters 2 inches high on orange background at 10'-0 foot intervals.
- 3 1. Entire floor area directly above conduits running beneath and within 12 inches of
4 a basement or ground floor that is in contact with earth or is framed above
5 unexcavated space.
- 6 2. Wall surfaces directly external to conduits concealed within wall.
- 7 3. All accessible surfaces of concrete envelope around conduits in vertical shafts,
8 exposed in building, or concealed above suspended ceilings.
- 9 3.2 SWITCH AND RECEPTACLE COVER PLATES
- 10 A. Provide identification on all switch and receptacle cover plates. Identification shall
11 indicate source and circuit number serving the device (i.e. "C1A #24").
- 12 B. Identification material to be a clear, 3/8-inch Kroy tape or Brother self-laminating vinyl
13 label with black letters in normal size "Swiss 721 Bold" font. Letter and number size to
14 3/16-inch high. Embossed Dymo-Tape labels are not acceptable. Permanently affix
15 identification label to cover plates, centered above the receptacle openings.
- 16 3.3 BOX LABELING
- 17 A. All junction, pull, and connection boxes shall be identified as follows:
- 18 1. For power and lighting circuits, indicate system voltage and identity of contained
19 circuits ("120V, 1LA1-3,5,7").
- 20 2. For other wiring, indicate system type and description of wiring ("FIRE ALARM
21 NAC #1").
- 22 B. Box covers shall be painted to correspond with system type as follows:
- 23 1. Fire Alarm: Red
24 2. Critical: Orange
25 3. Optional Emergency Branch: Yellow
26 4. Temperature Control/Building Automation: Blue
- 27 3.4 CONDUCTOR COLOR CODING
- 28 A. Color coding shall be applied at all panels, switches, junction boxes, pull boxes, vaults,
29 manholes etc., where the wires and cables are visible and terminations are made. The same
30 color coding shall be used throughout the entire electrical system, therefore maintaining
31 proper phasing throughout the entire project.
- 32 B. Where more than one nominal voltage system exists in a building or facility, the
33 identification of color coding used in the panelboard or equipment shall be permanently
34 posted on the interior of the door or cover.
- 35 C. All wires and cables, 6 AWG or larger, used in motor circuits, main feeders, sub-main
36 feeders and branch circuits, shall be coded by the application of plastic tape. The tape shall
37 be 3-M, Plymouth or Permacel, in colors specified below. The tape shall be applied at each
38 conductor termination with two 1-inch tape bands at 6-inch centers. Contractor option to
39 use colored cabling in lieu of the tape at each end for conductor 6 AWG to 500 KCM.
- 40 D. Wire and cables smaller than 6 AWG shall be color coded by the manufacturer.

- 1 E. Colored cable ties shall be applied in groups of three ties of specified color to each
2 conductor at each terminal or splice point starting 3 inches from the termination and spaced
3 at 3- inches centers. Tighten to a snug fit, and cut off excess length.
- 4 F. Where more than one nominal voltage system exists in a building or facility, each
5 ungrounded conductor of a multi-wire branch circuit, where accessible, shall be identified
6 by phase and system.
- 7 G. Conductors shall be color coded as follows:
- 8 1. 120/240 Volt, 3-Wire:
- 9 a. A-Phase – Black
10 b. B-Phase – Red
11 c. Neutral – White
12 d. Ground Bond – Green
- 13 2. 208Y/120 Volt, 4-Wire:
- 14 a. A-Phase – Black
15 b. B-Phase – Red
16 c. C-Phase – Blue
17 d. Neutral – White
18 e. Ground Bond – Green
- 19 3. 480Y/277 Volt, 4-Wire:
- 20 a. A-Phase – Brown
21 b. B-Phase – Orange
22 c. C-Phase – Yellow
23 d. Neutral – Gray
24 e. Ground Bond – Green

25 END OF SECTION

1

SECTION 26 27 26 - WIRING DEVICES

2

PART 1 - GENERAL

3

1.1 SECTION INCLUDES

4

A. Device plates and box covers

5

B. Receptacles including GFCI tamper resistant and/or weather resistant and TVSS

6

C. Wall switches

7

D. Indoor occupancy and vacancy sensors

8

1.2 QUALITY ASSURANCE

9

A. Provide similar devices from a single manufacturer.

10

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency to Authorities Having Jurisdiction and marked for intended use.

11

12

13

C. Comply with NFPA 70.

14

1.3 REFERENCES

15

A. DSCC W-C-896F – General Specification for Electrical Power Connector

16

B. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet

17

C. FS W-S-896 - Switch, Toggle

18

D. NEMA WD 1 – General Color Requirements for Wiring Devices

19

E. NEMA WD 6 – Wiring Devices – Dimensional Requirements

20

F. UL 498 – Standard for Attachment Plugs and Receptacles

21

G. UL 943 – Standard for Ground Fault Circuit Interrupters

22

H. UL 1472 – Solid-State Dimming Controls

23

1.4 SUBMITTALS

24

A. Submit product data under provisions of Section 26 05 00.

25

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

26

27

C. Submit manufacturer occupancy sensor coverage patterns applicable to this project. For areas requiring multiple sensor devices for appropriate coverage, submit specific manufacturer approved sensor layout as an overlay directly on the project drawings, either in print or approved electronic form.

28

29

30

31

PART 2 - PRODUCTS

32

2.1 DEVICE COLOR

33

A. All switch, receptacle, outlet, and coverplate colors shall be verified with Architect, unless indicated otherwise.

34

1 2.2 COVERPLATES

- 2 A. All switches, receptacles, and outlets shall be complete with the following:
- 3 1. Unbreakable thermoplastic/thermoset plastic coverplates in finished spaces where
4 wall are finished.
- 5 2. #302 stainless steel coverplates in unfinished spaces for flush boxes.
- 6 3. Galvanized steel coverplates in unfinished spaces for surface mounted boxes.
- 7 B. Where several devices are ganged together, the coverplate shall be of the ganged style for
8 the number of devices used.
- 9 C. Install nameplate identification as indicated in Section 26 05 53.
- 10 D. Plate securing screws shall be metal with head color matching the wall plate finish.

11 2.3 RECEPTACLES

- 12 A. Refer to Electrical Symbols List for device type.
- 13 B. Devices that are shaded on the drawings shall be red.
- 14 C. **[REC-DUP]:** NEMA 5-20R Duplex Receptacle:
- 15 1. 125 volt, 20 amp, 3-wire grounding type with impact resistant thermoplastic face
16 and steel back strap.
- 17 2. Approved Manufacturers: Hubbell 5352A, Leviton, 5362-S, Pass & Seymour
18 5362, Cooper 5352.
- 19 D. **[REC-DUP-GFI]:** NEMA 5-20R Ground Fault Duplex Receptacle:
- 20 1. 125 volt, 20 amp, 3-wire grounding type with test and reset buttons in impact
21 resistant thermoplastic face.
- 22 2. Approved Manufacturers: Hubbell GF20L, Leviton 7899, Pass & Seymour 2095,
23 Cooper VGF20.
- 24 E. **[REC-QUAD]:** NEMA 5-20R Double Duplex Receptacle:
- 25 1. Consists of two duplex receptacles, double gang box, plaster ring and faceplate.
- 26 2. Approved manufacturers: Refer to Duplex Receptacle above.
- 27 F. **[REC-QUAD-GFI]:** NEMA 5-20R Double Duplex GFI Receptacle:
- 28 1. Consists of two duplex GFI receptacles, double gang box, plaster ring and
29 faceplate.
- 30 2. Approved Manufacturers: Refer to Duplex GFI Receptacle above.
- 31 G. Back wired devices shall be complete with eight holes that are screw activated with metal
32 clamps for connection to #12 or #10 copper conductors.
- 33 H. Side wired devices shall have four binding screws that are undercut for positive wire
34 retention.

- 1 I. Ground Fault Circuit Interrupter (GFCI) receptacles shall comply with the 2006 edition of
2 U.L. 943 requiring increased surge immunity, improved corrosion resistance, improved
3 resistance to false tripping and diagnostic indication for miswiring if the line and load
4 conductors are reversed during installation.
- 5 J. Receptacles with modular wiring type quick connectors shall comply with the following in
6 addition to the above:
- 7 1. Wired with #12 THHN Cu, stranded or solid, 3 or 4 wire as required for device,
8 minimum 6" lead length.
- 9 2. Connector contacts shall be crimped or welded.
- 10 3. Modular connector shall be flush with back of device when fully inserted.
- 11 2.4 WALL SWITCHES
- 12 A. Refer to Electrical Symbols List for device type.
- 13 B. **[SW-1P]**: Single Pole Switch:
- 14 1. Single throw, 120/277 volt, 20 amp maintained contact. Toggle handle, side and
15 back wired.
- 16 2. Approved Manufacturers: Hubbell HBL1221, Leviton 1221-2, Pass & Seymour
17 PS20AC1, Cooper AH1221.
- 18 C. **[SW-1P-K]**: Key Lock Single Pole Switch:
- 19 1. Single throw, 120/277 volt, 20 amp maintained contact. Side and back wired.
20 Provide key to Owner.
- 21 2. Approved Manufacturers: Hubbell HBL1221L, Leviton 1221-2L, Pass &
22 Seymour PS20AC1-L, Cooper AH1221L. **[SPECIFER: Cooper has brown**
23 **only.]**
- 24 2.5 INDOOR OCCUPANCY AND VACANCY SENSORS
- 25 A. General Description: Wall- or ceiling-mounting, solid-state units with a separate power
26 supply/relay unit.
- 27 1. Operation: Unless otherwise indicated, turn lights on when covered area is
28 occupied and off when unoccupied, with a time delay for turning lights off,
29 adjustable over a minimum range of 1 to 30 minutes. Vacancy sensors require a
30 manual switch operation to turn lights on and off, with a time delay for turning
31 lights off when unoccupied.
- 32 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL
33 773A. Sensor shall be powered from the relay unit.
- 34 3. Relay Unit: Dry contacts rated for 20 A ballast load at 120 and 277 VAC, for 13
35 amp tungsten at 120 VAC, and for 1 hp at 120 VAC. Power supply to sensor shall
36 be 24 V dc, 150-mA, Class 2 power source as defined by NFPA 70.
- 37 4. Mounting:
- 38 a. Sensor: Suitable for mounting in any position on a standard outlet box.

- 1 b. Relay: Externally mounted through a 1/2-inch knockout in a standard
2 electrical enclosure. Mount relay above accessible ceiling near entry door
3 to room or area.
- 4 c. Time Delay and Sensitivity Adjustments: Recessed and concealed.
- 5 5. Indicator: LED to show when motion is being detected during testing and normal
6 operation of the sensor.
- 7 6. Bypass Switch: Override the on function in case of sensor failure.
- 8 7. Power Supply and Slave Packs: Provide as required for sensor quantity and
9 switching scheme. Mount to standard 1/2" knockout on electrical box above
10 accessible ceiling near entry door to room or area. Sensor power shall be from
11 emergency circuit if emergency lighting is in the area.
- 12 8. Detection Coverage (Room): Detect occupancy anywhere in an area based on
13 hand motion.
- 14 9. Detection Coverage (Corridor): Detect occupancy based on a half-step motion.
- 15 10. Warranty: Five (5) year warranty.
- 16 B. Mask sensors where necessary to prevent nuisance switching from adjacent areas.
- 17 C. PIR Type: Detect occupancy by sensing a combination of heat and movement in area of
18 coverage.
- 19 1. **[SW-OC-P-O]:** Wall Switch Occupancy Sensor:
 - 20 a. Passive infrared, zero crossing circuitry, adjustable sensitivity and time
21 delay, no minimum load requirements, manual or auto on operation,
22 Initial settings: 10 minutes, ambient sensor 40 FC.
 - 23 b. Approved Manufacturers: Watt Stopper PW-100 Series, Sensor Switch
24 WSX, Hubbell LHIRS1 or AP1277, Leviton ODS15, Greengate OSW-P-
25 0451.
- 26 D. Ultrasonic Type: Ceiling mounting. Detect occupancy by sensing a change in pattern of
27 reflected ultrasonic energy in area of coverage.
- 28 1. **[SW-OC-U]:** 360 Degree 20' x 20' Hand Motion Coverage Pattern:
 - 29 a. Frequency greater than 32 KHz solid state, adjustable sensitivity and
30 time delay, integral isolated, temperature and humidity resistant
31 receivers. Sensor shall control all circuits in area, unless noted otherwise.
 - 32 b. Approved Manufacturers: Watt Stopper WT-1100 series, Hubbell
33 OMNI-US or ATU series, Leviton OSC series, Greengate ODC-U series.
- 34 2. **[SW-OC-U2]:** 35' x 30' Hand Motion Coverage Pattern:
 - 35 a. Frequency greater than 32 KHz solid state, adjustable sensitivity and
36 time delay, integral isolated relay contact, temperature and humidity
37 resistant receivers. Sensor shall control all circuits in area, unless noted
38 otherwise.
 - 39 b. Approved Manufacturers: Watt Stopper WT-2200 series, Hubbell
40 OMNI-US or ATU series, Leviton OSC series, Greengate ODC-U series.

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SECTION 26 51 00 - LIGHTING

1

2 **PART 1 - GENERAL**

3 1.1 SECTION INCLUDES

- 4 A. Interior luminaires and accessories
- 5 B. Lamps
- 6 C. Ballasts

7 1.2 REFERENCES

- 8 A. ANSI C78.377-2008 – Specifications for the Chromaticity of Solid State Lighting Products
- 9 B. ANSI C82.4 - High-Intensity Discharge and Low-Pressure Sodium Lamps (Multiple-
10 Supply Type)
- 11 C. ANSI C82.6 - Ballasts for HID Lamps - Method Measurement
- 12 D. ANSI C82.11 - High Frequency Fluorescent Lamp Ballasts
- 13 E. ANSI C82.77-2002 – Standard for Harmonic Emission Limits and Related Power Quality
14 Requirements for Lighting Equipment
- 15 F. IEEE C2 - National Electrical Safety Code
- 16 G. NEMA LE 2 - H-I-D Lighting System Noise Criterion (LS-NC) Ratings
- 17 H. UL 935 – Standard for Fluorescent Lamp Ballasts

18 1.3 SUBMITTALS

- 19 A. Submit product data under provisions of Section 26 05 00.
- 20 B. Submit product data sheets for luminaires, lamps, ballasts, drivers and poles. Include
21 complete product model number with all options as specified. Submittal shall be arranged
22 with fixtures listed in ascending order, and with each luminaire’s associated lamp, ballast,
23 driver, or pole information following luminaire’s product data. Failure to organize
24 submittal in this manner will result in the submittal being rejected.
- 25 C. Submit lens product data, dimensions and weights if not included in product data sheet
26 submittal.
- 27 D. Include outline drawings, support points, weights, and accessory information for each
28 luminaire type.
- 29 E. Submit utility rebate forms, where offered at project location, with rebate items completed.
- 30 F. LED luminaire submittals shall include photometric report per IESNA LM-79-08 for the
31 latest generation system being furnished, including independent testing laboratory name,
32 report number, date, luminaire model number, input wattage, luminaire, and light source
33 specifications. Manufacturer origin of LED chipset and driver shall be submitted.
- 34 G. For all LED luminaires specified as dimmer controlled, submit dimmer device data that is
35 approved by manufacturer of submitted luminaire and that Contractor proposes to furnish
36 and install. Contractor is responsible for verifying that installed dimming controls are
37 compatible with and approved by the luminaire manufacturer.

1 1.4 DELIVERY, STORAGE, AND HANDLING

- 2 A. Deliver products to site. Store and protect under provisions of Section 26 05 00.
- 3 B. Protect luminaire finishes, lenses, and trims from damage during storage and installation.
4 Do not remove protective films until construction cleanup within each area is complete.
- 5 C. Handle site lighting poles carefully to prevent breakage and damage to finish.

6 1.5 WARRANTY

- 7 A. Fluorescent ballasts shall carry a three-year warranty from date of Substantial Completion.
8 HID ballasts shall carry a two-year warranty from date of Substantial Completion.
9 Dimming electronic ballasts shall have a five year warranty.
- 10 B. Emergency fluorescent ballast shall have a five-year warranty from date of substantial
11 completion.
- 12 C. Fluorescent lamps shall carry a two-year warranty from date of Substantial Completion.
- 13 D. HID lamps shall carry a one-year warranty from date of Substantial Completion.
- 14 E. Light emitting diode (LED) light engines and drivers shall have a five-year warranty from
15 date of Substantial Completion.

16 **PART 2 - PRODUCTS**

17 2.1 INTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

- 18 A. Recessed Luminaires: Confirm ceiling and wall type and furnish trim and accessories
19 necessary to permit proper installation in each system. Where fire-rated ceiling or wall
20 assemblies are specified, furnish and install listed enclosures around luminaires that
21 maintain the system rating.
- 22 B. Painted reflector surfaces shall have a minimum reflectance of 90%.
- 23 C. All painted components shall be painted after fabrication.

24 2.2 LIGHT EMITTING DIODE (LED) LUMINAIRE SYSTEMS

- 25 A. Light emitting diodes used in interior applications shall have a minimum color rendering
26 index (CRI) of 80. Light emitting diodes used in exterior applications shall have a
27 minimum color rendering index (CRI) of 70. Color temperature of the luminaires shall be
28 as noted on the luminaire schedule.
- 29 B. LED chip arrays specified as color changing shall have chip colors as noted on the
30 luminaire schedule.
- 31 C. LED chips shall be wired so that failure of one chip does not prohibit operation of the
32 remainder of the chip array.
- 33 D. LED Driver:
- 34 1. Solid state driver with integral heat sink. Driver shall have overheat, short-circuit
35 and overload protection, power factor 0.90 or above and maximum total harmonic
36 distortion of 20%. Surge suppression device for all exterior luminaires.
- 37 2. Drivers shall have dimming capabilities as outlined in the luminaire schedule for

1 each luminaire type.

2 3. Driver shall have a minimum of 50,000 hours rated life.

3 2.3 ACCEPTABLE MANUFACTURERS – LAMPS

MANUFACTURER	FLUORESCENT
Philips Lighting Company	X
Osram Sylvania	X
Venture Lighting International Inc.	
GE Lighting	X
USHIO America, Inc.	X

4 A. Lamps used with dimming shall be verified for compatibility with dimmer manufacturer
5 prior to ordering.

6 2.4 FLUORESCENT LAMPS

7 A. T-8 Type: Correlated color temperature (CCT) and Color Rendering Index (CRI) as
8 scheduled on the drawings. Lamps shall be reduced mercury type having credentials that
9 pass the EPA 1990 Toxic Characteristics. Four-foot, 32-watt lamps shall be 3100 lumen
10 extended performance type, with minimum 30,000-hour lamp life at three-hour starts.

11 2.5 FLUORESCENT BALLASTS - GENERAL

12 A. All ballasts shall have a Class A sound rating, or better.

13 B. Ballast shall comply with EMI and RFI limits set by FCC (CFR 47 Part 18).

14 C. Linear fluorescent ballasts shall operate parallel circuit lamps that allow remaining lamps
15 to maintain full output if companion lamps fail.

16 D. All fluorescent ballasts designed for operation of double-ended lamps or integral to a
17 luminaire supplied by multi-wire branch circuits shall comply with disconnecting means as
18 specified in NEC Article 410 and amendments thereto.

19 2.6 ACCEPTABLE MANUFACTURERS - FLUORESCENT ELECTRONIC BALLASTS

MANUFACTURER	PRS	IS-10%THD
A. Advance	IOP	IOP, RCN, VCN
B. GE	UltraStart	UltraMax
C. MagnaTek/Universal	AccuStart Ultim8	Ultim8
D. Osram/Sylvania	QuickTronic	QuickTronic

20 2.7 FLUORESCENT ELECTRONIC BALLAST

21 A. Fluorescent Ballast: Shall meet UL Standard 935. Ballasts shall be PROGRAM RAPID
22 START (PRS) type.

23 B. Ballasts operated by occupancy sensors shall be program rapid start type.

- 1 C. Ballasts shall meet applicable ANSI and IEEE standards regarding harmonic distortion and
2 surge protection. The input current 3rd harmonic content shall not exceed 13% of the input
3 current. The total harmonic distortion shall not exceed 10%.
- 4 D. Fluorescent ballasts shall conform to the performance criteria listed below:
- 5 1. Ballast factor as indicated on luminaire schedule.
- 6 2. Mean System Efficacy:
- 7 a. Instant Start: ≥ 90 MLPW (T8)
- 8 b. Program Start: ≥ 88 MLPW(T8); ≥ 87 MLPW(T5); ≥ 85 MLPW(T5HO)
- 9 E. Luminaires designed as multi-level switching shall have combination of 1, 2 or 3 lamp
10 ballasts configured to allow switching of all inboard lamps as a group separate from
11 outboard lamps in the room. Master/slave luminaire arrangement is preferred where
12 practical. The Contractor shall verify ballast configuration to achieve switching shown.
- 13 F. The ballast must maintain constant high output through input voltage ranges of 90 to 145
14 volts for a 120V ballast (+/- 25%) and 200 to 320 volt for a 277V ballast (+/- 28%).
- 15 G. Ballast Requirements:
- 16 1. Current crest factor shall be no greater than 1.8 for F40 lamps and 1.7 for all other
17 lamps.
- 18 2. The operating ambient temperature range shall be 50°F to 105°F.
- 19 3. Fluorescent ballasts shall operate at 20KHZ or higher, with no detectable lamp
20 flicker.
- 21 4. Ballasts shall not be affected by lamp failure and shall yield normal lamp life.
- 22 5. Ballast power factor shall be greater than 90%.
- 23 6. Ballast shall be rated Class P and shall be thermally protected.
- 24 7. Program rapid start ballasts shall heat the filament prior to applying the starting
25 voltage to the lamp, then remove lamp cathode heat in a sequence consistent with
26 ANSI standard C82.11.
- 27 8. Cold weather ballast(s) must reliably start and operate lamps in ambient
28 temperatures down to 0°F for the rated life of the lamps.

29 **PART 3 - EXECUTION**

30 3.1 INSTALLATION

- 31 A. Securely fasten luminaires to the ceiling framing member by mechanical means such as
32 bolts, screws, rivets or listed clips identified for use with the type of ceiling framing
33 members.
- 34 B. Install lamps in lamp holders of luminaires.
- 35 C. Support surface-mounted luminaires directly from building structure. Install luminaires
36 larger than eight square feet (8 ft²) or weighing more than 30 pounds independent of ceiling
37 framing.

- 1 D. Support suspended or pendant mounted luminaires independent of ceiling grid with a
2 minimum of two #12 gauge wires. Suspension assembly and anchors shall be capable of
3 supporting 300 pounds dead load at each suspension point.
- 4 E. Install recessed luminaires to permit removal from below. Use plaster frames or install
5 grid clips. Support luminaires independent of ceiling grid with a minimum of two (2) #12
6 gauge wires located on diagonal corners.
- 7 F. Adjust aimable luminaires to obtain lighting levels on objects and areas as directed to
8 obtain desired lighting levels.
- 9 G. Parabolic louvers and other optical accessories shall remain in protective wraps or films
10 until construction in area is complete and area has been cleaned.
- 11 H. Industrial Pendant Luminaires: Use hangers rated 500 pounds minimum or provide safety
12 chain between ballast and structure. Provide safety chain between reflector and ballast.
- 13 I. Fire-rated Ceilings: Support luminaires independent of ceiling system with a minimum of
14 two (2) #12 gauge wires.
- 15 3.2 LAMP SEASONING
- 16 A. Operate all fluorescent and HID lamps for 100 hours prior to requesting final observation.
17 Operate lamps for minimum 8 hour intervals during seasoning.
- 18 3.3 RELAMPING
- 19 A. Replace failed lamps at completion of work. Replacement of incandescent and other lamp
20 burnouts after the warranty period starts shall be the responsibility of the final user.
- 21 3.4 ADJUSTING AND CLEANING
- 22 A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint
23 splatters, dirt, and debris from installed luminaires.
- 24 B. Touch up luminaire and pole finish at completion of work.
- 25 3.5 LUMINAIRE SCHEDULE
- 26 A. As shown on the drawings.

27 END OF SECTION

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SECTION E: BIDDERS ACKNOWLEDGEMENT

**MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO. 7565**

Bidder must state a Unit Price and Total Bid for each item. The Total Bid for each item must be the product of quantity, by Unit Price. The Grand Total must be the sum of the Total Bids for the various items. In case of multiplication errors or addition errors, the Grand Total with corrected multiplication and/or addition shall determine the Grand Total bid for each contract. The Unit Price and Total Bid must be entered numerically in the spaces provided. All words and numbers shall be written in ink.

1. The undersigned having familiarized himself/herself with the Contract documents, including Advertisement for Bids, Instructions to Bidders, Form of Proposal, City of Madison Standard Specifications for Public Works Construction - 2015 Edition thereto, Form of Agreement, Form of Bond, and Addenda issued and attached to the plans and specifications on file in the office of the City Engineer, hereby proposes to provide and furnish all the labor, materials, tools, and expendable equipment necessary to perform and complete in a workmanlike manner the specified construction on this project for the City of Madison; all in accordance with the plans and specifications as prepared by the City Engineer, including Addenda to the Contract Nos. _____ through _____ issued thereto, at the prices for said work as contained in this proposal. (Electronic bids submittals shall acknowledge addendum under Section E and shall not acknowledge here)
2. If awarded the Contract, we will initiate action within seven (7) days after notification or in accordance with the date specified in the contract to begin work and will proceed with diligence to bring the project to full completion within the number of work days allowed in the Contract or by the calendar date stated in the Contract.
3. The undersigned Bidder or Contractor certifies that he/she is not a party to any contract, combination in form of trust or otherwise, or conspiracy in restraint of trade or commerce or any other violation of the anti-trust laws of the State of Wisconsin or of the United States, with respect to this bid or contract or otherwise.
4. I hereby certify that I have met the Bid Bond Requirements as specified in Section 102.5. *(IF BID BOND IS USED, IT SHALL BE SUBMITTED ON THE FORMS PROVIDED BY THE CITY. FAILURE TO DO SO MAY RESULT IN REJECTION OF THE BID).*
5. I hereby certify that all statements herein are made on behalf of _____ (name of corporation, partnership, or person submitting bid) a corporation organized and existing under the laws of the State of _____ a partnership consisting of _____; an individual trading as _____; of the City of _____ State of _____; that I have examined and carefully prepared this Proposal, from the plans and specifications and have checked the same in detail before submitting this Proposal; that I have fully authority to make such statements and submit this Proposal in (its, their) behalf; and that the said statements are true and correct.

SIGNATURE

TITLE, IF ANY

Sworn and subscribed to before me this _____ day of _____, 20_____.

(Notary Public or other officer authorized to administer oaths)
My Commission Expires _____

Bidders shall not add any conditions or qualifying statements to this Proposal.

SECTION F: DISCLOSURE OF OWNERSHIP & BEST VALUE CONTRACTING

MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION CONTRACT NO. 7565

State of Wisconsin
Department of Workforce Development
Equal Rights Division
Labor Standards Bureau

Disclosure of Ownership

<p>Notice required under Section 15.04(1)(m), Wisconsin Statutes. The statutory authority for the use of this form is prescribed in Sections 66.0903(12)(d) and 103.49(7)(d), Wisconsin Statutes. The use of this form is mandatory. The penalty for failing to complete this form is prescribed in Section 103.005(12), Wisconsin Statutes. Personal information you provide may be used for secondary purposes.</p>			
<p>(1) On the date a contractor submits a bid to or completes negotiations with a state agency or local governmental unit, on a project subject to Section 66.0903 or 103.49, Wisconsin Statutes, the contractor shall disclose to such state agency or local governmental unit the name of any "other construction business", which the contractor, or a shareholder, officer or partner of the contractor, owns or has owned within the preceding three (3) years.</p> <p>(2) The term "other construction business" means any business engaged in the erection, construction, remodeling, repairing, demolition, altering or painting and decorating of buildings, structures or facilities. It also means any business engaged in supplying mineral aggregate, or hauling excavated material or spoil as provided by Sections 66.0903(3), 103.49(2) and 103.50(2), Wisconsin Statutes.</p> <p>(3) This form must ONLY be filed, with the state agency or local governmental unit that will be awarding the contract, if both (A) and (B) are met.</p> <p>(A) The contractor, or a shareholder, officer or partner of the contractor:</p> <p style="margin-left: 20px;">(1) Owns at least a 25% interest in the "other construction business", indicated below, on the date the contractor submits a bid or completes negotiations.</p> <p style="margin-left: 20px;">(2) Or has owned at least a 25% interest in the "other construction business" at any time within the preceding three (3) years.</p> <p>(B) The Wisconsin Department of Workforce Development (DWD) has determined that the "other construction business" has failed to pay the prevailing wage rate or time and one-half the required hourly basic rate of pay, for hours worked in excess of the prevailing hours of labor, to any employee at any time within the preceding three (3) years.</p>			
Other Construction Business			
Not Applicable <input type="checkbox"/>			
Name of Business			
Street Address or P O Box	City	State	Zip Code
Name of Business			
Street Address or P O Box	City	State	Zip Code
Name of Business			
Street Address or P O Box	City	State	Zip Code
<p>I hereby state under penalty of perjury that the information, contained in this document, is true and accurate according to my knowledge and belief.</p>			
Print the Name of Authorized Officer			
Signature of Authorized Officer		Date Signed	
Name of Corporation, Partnership or Sole Proprietorship			
Street Address or P O Box	City	State	Zip Code

If you have any questions call (608) 266-0028

ERD-7777-E (R. 09/2003)

**MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO. 7565**

Best Value Contracting

1. The Contractor shall indicate the non-apprenticeable trades used on this contract.

2. Madison General Ordinance (M.G.O.), 33.07(7), does provide for some exemptions from the active apprentice requirement. Apprenticeable trades are those trades considered apprenticeable by the State of Wisconsin. Please check applicable box if you are seeking an exemption.

- Contractor has a total skilled workforce of four or less individuals in all apprenticeable trades combined.
- No available trade training program; The Contractor has been rejected by the only available trade training program, or there is no trade training program within 90 miles.
- Contractor is not using an apprentice due to having a journey worker on layoff status, provided the journey worker was employed by the contractor in the past six months.
- First-time Contractor on City of Madison Public Works contract requests a onetime exemption but intends to comply on all future contracts and is taking steps typical of a "good faith" effort.
- Contractor has been in business less than one year.
- Contractor doesn't have enough journeyman trade workers to qualify for a trade training program in that respective trade

3. The Contractor shall indicate on the following section which apprenticeable trades are to be used on this contract. Compliance with active apprenticeship, to the extent required by M.G.O. 33.07(7), shall be satisfied by documentation from an applicable trade training body; an apprenticeship contract with the Wisconsin Department of Workforce Development or a similar agency in another state; or the U.S Department of Labor. This documentation is required prior to the Contractor beginning work on the project site.

- The Contractor has reviewed the list and shall not use any apprenticeable trades on this project.

LIST APPRENTICABLE TRADES (check all that apply to your work to be performed on this contract)

- BRICKLAYER
- CARPENTER
- CEMENT MASON / CONCRETE FINISHER
- CEMENT MASON (HEAVY HIGHWAY)
- CONSTRUCTION CRAFT LABORER
- DATA COMMUNICATION INSTALLER
- ELECTRICIAN
- ENVIRONMENTAL SYSTEMS TECHNICIAN / HVAC SERVICE TECH/HVAC INSTALL / SERVICE
- GLAZIER
- HEAVY EQUIPMENT OPERATOR / OPERATING ENGINEER
- INSULATION WORKER (HEAT & FROST)
- IRON WORKER
- IRON WORKER (ASSEMBLER, METAL BLDGS)
- PAINTER & DECORATOR
- PLASTERER
- PLUMBER
- RESIDENTIAL ELECTRICIAN
- ROOFER & WATER PROOFER
- SHEET METAL WORKER
- SPRINKLER FITTER
- STEAMFITTER
- STEAMFITTER (REFRIGERATION)
- STEAMFITTER (SERVICE)
- TAPER & FINISHER
- TELECOMMUNICATIONS (VOICE, DATA & VIDEO) INSTALLER-TECHNICIAN
- TILE SETTER

SECTION G: BID BOND

KNOW ALL MEN BY THESE PRESENT, THAT _____ (a corporation of the State of _____) (individual), (partnership), hereinafter referred to as the "Principal") and _____, a corporation of the State of _____ (hereinafter referred to as the "Surety") and licensed to do business in the State of Wisconsin, are held and firmly bound unto the City of Madison, (hereinafter referred to as the "Obligee"), in the sum of five per cent (5%) of the amount of the total bid or bids of the Principal herein accepted by the Obligee, for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that, whereas the Principal has submitted, to the City of Madison a certain bid, including the related alternate, and substitute bids attached hereto and hereby made a part hereof, to enter into a contract in writing for the construction of:

MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION CONTRACT NO. 7565

1. If said bid is rejected by the Obligee, then this obligation shall be void.
2. If said bid is accepted by the Obligee and the Principal shall execute and deliver a contract in the form specified by the Obligee (properly completed in accordance with said bid) and shall furnish a bond for his/her faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void.

If said bid is accepted by the Obligee and the Principal shall fail to execute and deliver the contract and the performance and payment bond noted in 2. above executed by this Surety, or other Surety approved by the City of Madison, all within the time specified or any extension thereof, the Principal and Surety agree jointly and severally to forfeit to the Obligee as liquidated damages the sum mentioned above, it being understood that the liability of the Surety for any and all claims hereunder shall in no event exceed the sum of this obligation as stated, and it is further understood that the Principal and Surety reserve the right to recover from the Obligee that portion of the forfeited sum which exceed the actual liquidated damages incurred by the Obligee.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Obligee may accept such bid, and said Surety does hereby waive notice of any such extension.

Certificate of Biennial Bid Bond

TIME PERIOD - VALID (FROM/TO)
NAME OF SURETY
NAME OF CONTRACTOR
CERTIFICATE HOLDER <p style="text-align: center;">City of Madison, Wisconsin</p>

This is to certify that a biennial bid bond issued by the above-named Surety is currently on file with the City of Madison.

This certificate is issued as a matter of information and conveys no rights upon the certificate holder and does not amend, extend or alter the coverage of the biennial bid bond.

Cancellation: Should the above policy be cancelled before the expiration date, the issuing Surety will give thirty (30) days written notice to the certificate holder indicated above.

Signature of Authorized Contractor Representative

Date

SECTION H: AGREEMENT

THIS AGREEMENT made this _____ day of _____ in the year Two Thousand and Fifteen between _____ hereinafter called the Contractor, and the City of Madison, Wisconsin, hereinafter called the City.

WHEREAS, the Common Council of the said City of Madison under the provisions of a resolution adopted _____, and by virtue of authority vested in the said Council, has awarded to the Contractor the work of performing certain construction.

NOW, THEREFORE, the Contractor and the City, for the consideration hereinafter named, agree as follows:

1. **Scope of Work.** The Contractor shall, perform the construction, execution and completion of the following listed complete work or improvement in full compliance with the Plans, Specifications, Standard Specifications, Supplemental Specifications, Special Provisions and contract; perform all items of work covered or stipulated in the proposal; perform all altered or extra work; and shall furnish, unless otherwise provided in the contract, all materials, implements, machinery, equipment, tools, supplies, transportation, and labor necessary to the prosecution and completion of the work or improvements:

MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION CONTRACT NO. 7565

2. **Completion Date/Contract Time.** Construction work must begin within seven (7) calendar days after the date appearing on mailed written notice to do so shall have been sent to the Contractor and shall be carried on at a rate so as to secure full completion SEE SPECIAL PROVISIONS, the rate of progress and the time of completion being essential conditions of this Agreement.
3. **Contract Price.** The City shall pay to the Contractor at the times, in the manner and on the conditions set forth in said specifications, the sum of _____ (\$ _____) Dollars being the amount bid by such Contractor and which was awarded to him/her as provided by law.
4. **Wage Rates for Employees of Public Works Contractors**

General and Authorization. The Contractor shall compensate its employees at the prevailing wage rate in accordance with section 66.0903, Wis. Stats., DWD 290 of the Wisconsin Administrative Code and as hereinafter provided unless otherwise noted in Section D: Special Provisions, Subsection 102.10 – Minimum Rate of Wage Scale.

“Public Works” shall include building or work involving the erection, construction, remodeling, repairing or demolition of buildings, parking lots, highways, streets, bridges, sidewalks, street lighting, traffic signals, sanitary sewers, water mains and appurtenances, storm sewers, and the grading and landscaping of public lands.

“Building or work” includes construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work, except for the delivery of mineral aggregate such as sand, gravel, bituminous asphaltic concrete or stone which is incorporated into the work under contract with the City by depositing the material directly in final place from transporting vehicle.

“Erection, construction, remodeling, repairing” means all types of work done on a particular building or work at the site thereof in the construction or development of the project, including without limitation, erecting, construction, remodeling, repairing, altering, painting, and decorating, the transporting of materials and supplies to or from the building or work done by the employees of the Contractor, Subcontractor, or Agent thereof, and the manufacturing or furnishing of

materials, articles, supplies or equipment on the site of the building or work, by persons employed by the Contractor, Subcontractor, or Agent thereof.

"Employees working on the project" means laborers, workers, and mechanics employed directly upon the site of work.

"Laborers, Workers, and Mechanics" include pre-apprentices, helpers, trainees, learners and properly registered and indentured apprentices but exclude clerical, supervisory, and other personnel not performing manual labor.

Establishment of Wage Rates. The Department of Public Works shall periodically obtain a current schedule of prevailing wage rates from DWD. The schedule shall be used to establish the City of Madison Prevailing Wage Rate Schedule for Public Works Construction (prevailing wage rate). The Department of Public Works may include known increases to the prevailing wage rate which can be documented and are to occur on a future specific date. The prevailing wage rate shall be included in public works contracts subsequently negotiated or solicited by the City. Except for known increases contained within the schedule, the prevailing wage rate shall not change during the contract. The approved wage rate is attached hereto.

Workforce Profile. The Contractor shall, at the time of signature of the contract, notify the City Engineer in writing of the names and classifications of all the employees of the Contractor, Subcontractors, and Agents proposed for the work. In the alternative, the Contractor shall submit in writing the classifications of all the employees of the Contractor, Subcontractors and Agents and the total number of hours estimated in each classification for the work. This workforce profile(s) shall be reviewed by the City Engineer who may, within ten (10) days, object to the workforce profile(s) as not being reflective of that which would be required for the work. The Contractor may request that the workforce profile, or a portion of the workforce profile, be submitted after the signature of the contract but at least ten (10) days prior to the work commencing. Any costs or time loss resulting from modifications to the workforce profile as a result of the City Engineer's objections shall be the responsibility of the Contractor.

Payrolls and Records. The Contractor shall keep weekly payroll records setting forth the name, address, telephone number, classification, wage rate and fringe benefit package of all the employees who work on the contract, including the employees of the Contractor's subcontractors and agents. Such weekly payroll records must include the required information for all City contracts and all other contracts on which the employee worked during the week in which the employee worked on the contract. The Contractor shall also keep records of the individual time each employee worked on the project and for each day of the project. Such records shall also set forth the total number of hours of overtime credited to each such employee for each day and week and the amount of overtime pay received in that week. The records shall set forth the full weekly wages earned by each employee and the actual hourly wage paid to the employee.

The Contractor shall submit the weekly payroll records, including the records of the Contractor's subcontractors and agents, to the City Engineer for every week that work is being done on the contract. The submittal shall be within twenty-one (21) calendar days of the end of the Contractor's weekly pay period.

Employees shall receive the full amounts accrued at the time of the payment, computed at rates not less than those stated in the prevailing wage rate and each employee's rate shall be determined by the work that is done within the trade or occupation classification which should be properly assigned to the employee.

An employee's classification shall not be changed to a classification of a lesser rate during the contract. If, during the term of the contract, an employee works in a higher pay classification than the one which was previously properly assigned to the employee, then that employee shall be considered to be in the higher pay classification for the balance of the contract, receive the appropriate higher rate of pay, and she/he shall not receive a lesser rate during the balance of the

contract. For purposes of clarification, it is noted that there is a distinct difference between working in a different classification with higher pay and doing work within a classification that has varying rates of pay which are determined by the type of work that is done within the classification. For example, the classification "Operating Engineer" provides for different rates of pay for various classes of work and the Employer shall compensate an employee classified as an "Operating Engineer" based on the highest class of work that is done in one day. Therefore, an "Operating Engineer's" rate may vary on a day to day basis depending on the type of work that is done, but it will never be less than the base rate of an "Operating Engineer". Also, as a matter of clarification, it is recognized that an employee may work in a higher paying classification merely by chance and without prior intention, calculation or design. If such is the case and the performance of the work is truly incidental and the occurrence is infrequent, inconsequential and does not serve to undermine the single classification principle herein, then it may not be required that the employee be considered to be in the higher pay classification and receive the higher rate of pay for the duration of the contract. However, the Contractor is not precluded or prevented from paying the higher rate for the limited time that an employee performs work that is outside of the employee's proper classification.

Questions regarding an employee's classification, rate of pay or rate of pay within a classification, shall be resolved by reference to the established practice that predominates in the industry and on which the trade or occupation rate/classification is based. Rate of pay and classification disputes shall be resolved by relying upon practices established by collective bargaining agreements and guidelines used in such determination by appropriate recognized trade unions operating within the City of Madison.

The Contractor, its Subcontractors and Agents shall submit to interrogation regarding compliance with the provisions of this ordinance.

Mulcting of the employees by the Contractor, Subcontractor, and Agents on Public Works contracts, such as by kickbacks or other devices, is prohibited. The normal rate of wage of the employees of the Contractor, Subcontractor, and Agents shall not be reduced or otherwise diminished as a result of payment of the prevailing wage rate on a public works contract.

Hourly contributions. Hourly contributions shall be determined in accordance with the prevailing wage rate and with DWD. 290.01(10), Wis. Admin. Code.

Apprentices and Subjourney persons. Apprentices and sub journeypersons performing work on the project shall be compensated in accordance with the prevailing wage rate and with DWD 290.02, and 290.025, respectively, Wis. Admin. Code.

Straight Time Wages. The Contractor may pay straight time wages as determined by the prevailing wage rate and DWD 290.04, Wis. Admin. Code.

Overtime Wages. The Contractor shall pay overtime wages as required by the prevailing wage rate and DWD 290.05, Wis. Admin. Code.

Posting of Wage Rates and Hours. A clearly legible copy of the prevailing wage rate, together with the provisions of Sec. 66.0903(10)(a) and (11)(a), Wis. Stats., shall be kept posted in at least one conspicuous and easily accessible place at the project site by the Contractor and such notice shall remain posted during the full time any laborers, workers or mechanics are employed on the contract.

Evidence of Compliance by Contractor. Upon completion of the contract, the Contractor shall file with the Department of Public Works an affidavit stating:

- a. That the Contractor has complied fully with the provisions and requirements of Sec. 66.0903(3), Wis. Stats., and Chapter DWD 290, Wis. Admin. Code; the Contractor has received evidence of compliance from each of the agents and subcontractors; and the

names and addresses of all of the subcontractors and agents who worked on the contract.

- b. That full and accurate records have been kept, which clearly indicate the name and trade or occupation of every laborer, worker or mechanic employed by the Contractor in connection with work on the project. The records shall show the number of hours worked by each employee and the actual wages paid therefore; where these records will be kept and the name, address and telephone number of the person who will be responsible for keeping them. The records shall be retained and made available for a period of at least three (3) years following the completion of the project of public works and shall not be removed without prior notification to the municipality.

Evidence of Compliance by Agent and Subcontractor. Each agent and subcontractor shall file with the Contractor, upon completion of their portion of the work on the contract an affidavit stating that all the provisions of Sec. 66.0903(3), Wis. Stats., have been fully complied with and that full and accurate records have been kept, which clearly indicate the name and trade or occupation of every laborer, worker or mechanic employed by the Contractor in connection with work on the project. The records shall show the number of hours worked by each employee and the actual wages paid therefore; where these records shall be kept and the name, address and telephone number of the person who shall be responsible for keeping them. The records shall be retained and made available for a period of at least three (3) years following the completion of the project of public works and shall not be removed without prior notification to the municipality.

Failure to Comply with the Prevailing Wage Rate. If the Contractor fails to comply with the prevailing wage rate, she/he shall be in default on the contract. In addition, if DWD finds that a contractor or subcontractor violated the prevailing wage law, DWD will assess liquidated damages of 100% of the wages owed to employees.

Establishment of Wage Rates. The Department of Public Works shall periodically obtain a current schedule of prevailing wage rates from DWD. The schedule shall be used to establish the City of Madison Prevailing Wage Rate Schedule for Public Works Construction (prevailing wage rate). The Department of Public Works may include known increases to the prevailing wage rate which can be documented and are to occur on a future specific date. The prevailing wage rate shall be included in public works contracts subsequently negotiated or solicited by the City. Except for known increases contained within the schedule, the prevailing wage rate shall not change during the contract. The approved wage rate and DWD prevailing wage requirements are attached hereto as Sec. I of the contract.

5. **Affirmative Action.** In the performance of the services under this Agreement the Contractor agrees not to discriminate against any employee or applicant because of race, religion, marital status, age, color, sex, disability, national origin or ancestry, income level or source of income, arrest record or conviction record, less than honorable discharge, physical appearance, sexual orientation, gender identity, political beliefs, or student status. The Contractor further agrees not to discriminate against any subcontractor or person who offers to subcontract on this contract because of race, religion, color, age, disability, sex, sexual orientation, gender identity or national origin.

The Contractor agrees that within thirty (30) days after the effective date of this agreement, the Contractor will provide to the City Affirmative Action Division certain workforce utilization statistics, using a form to be furnished by the City.

If the contract is still in effect, or if the City enters into a new agreement with the Contractor, within one year after the date on which the form was required to be provided, the Contractor will provide updated workforce information using a second form, also to be furnished by the City. The second form will be submitted to the City Affirmative Action Division no later than one year after the date on which the first form was required to be provided.

The Contractor further agrees that, for at least twelve (12) months after the effective date of this contract, it will notify the City Affirmative Action Division of each of its job openings at facilities in Dane County for which applicants not already employees of the Contractor are to be considered. The notice will include a job description, classification, qualifications and application procedures and deadlines. The Contractor agrees to interview and consider candidates referred by the Affirmative Action Division if the candidate meets the minimum qualification standards established by the Contractor, and if the referral is timely. A referral is timely if it is received by the Contractor on or before the date started in the notice.

Articles of Agreement Article I

The Contractor shall take affirmative action in accordance with the provisions of this contract to insure that applicants are employed, and that employees are treated during employment without regard to race, religion, color, age, marital status, disability, sex, sexual orientation, gender identity or national origin and that the employer shall provide harassment free work environment for the realization of the potential of each employee. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training including apprenticeship insofar as it is within the control of the Contractor. The Contractor agrees to post in conspicuous places available to employees and applicants notices to be provided by the City setting out the provisions of the nondiscrimination clauses in this contract.

Article II

The Contractor shall in all solicitations or advertisements for employees placed by or on behalf of the Contractors state that all qualified or qualifiable applicants will be employed without regard to race, religion, color, age, marital status, disability, sex, sexual orientation, gender identity or national origin.

Article III

The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding a notice to be provided by the City advising the labor union or worker's representative of the Contractor's equal employment opportunity and affirmative action commitments. Such notices shall be posted in conspicuous places available to employees and applicants for employment.

Article V

The Contractor agrees that it will comply with all provisions of the Affirmative Action Ordinance of the City of Madison, including the contract compliance requirements. The Contractor agrees to submit the model affirmative action plan for public works contractors in a form approved by the Affirmative Action Division Manager.

Article VI

The Contractor will maintain records as required by Section 39.02(9)(f) of the Madison General Ordinances and will provide the City Affirmative Action Division with access to such records and to persons who have relevant and necessary information, as provided in Section 39.02(9)(f). The City agrees to keep all such records confidential, except to the extent that public inspection is required by law.

Article VII

In the event of the Contractor's or subcontractor's failure to comply with the Equal Employment Opportunity and Affirmative Action Provisions of this contract or Section 39.03 and 39.02 of the Madison General Ordinances, it is agreed that the City at its option may do any or all of the following:

1. Cancel, terminate or suspend this Contract in whole or in part.
2. Declare the Contractor ineligible for further City contracts until the Affirmative Action requirements are met.
3. Recover on behalf of the City from the prime Contractor 0.5 percent of the contract award price for each week that such party fails or refuses to comply, in the nature of liquidated damages, but not to exceed a total of five percent (5%) of the contract price, or five thousand dollars (\$5,000), whichever is less. Under public works contracts, if a subcontractor is in noncompliance, the City may recover liquidated damages from the prime Contractor in the manner described above. The preceding sentence shall not be construed to prohibit a prime Contractor from recovering the amount of such damage from the non-complying subcontractor.

Article VIII

The Contractor shall include the above provisions of this contract in every subcontract so that such provisions will be binding upon each subcontractor. The Contractor shall take such action with respect to any subcontractor as necessary to enforce such provisions, including sanctions provided for noncompliance.

Article IX

The Contractor shall allow the maximum feasible opportunity to small business enterprises to compete for any subcontracts entered into pursuant to this contract. (In federally funded contracts the terms "DBE, MBE and WBE" shall be substituted for the term "small business" in this Article.)

6. Substance Abuse Prevention Program Required. Prior to commencing work on the Contract, the Contractor, and any Subcontractor, shall have in place a written program for the prevention of substance abuse among its employees as required under Wis. Stat. Sec. 103.503.

**MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO. 7565**

IN WITNESS WHEREOF, the Contractor has hereunto set his/her hand and seal and the City has caused these presents to be sealed with its corporate seal and to be subscribed by its Mayor and City Clerk the day and year first above written.

Countersigned:

	Company Name
Witness	Date
Witness	Date

	President
Witness	Date
Witness	Date

	Secretary

CITY OF MADISON, WISCONSIN

Provisions have been made to pay the liability that will accrue under this contract.

Approved as to form:

Finance Director	City Attorney
Signed this _____ day of _____, 20_____	
Witness	Date
Witness	Date

	Mayor
Witness	Date
Witness	Date

	City Clerk

SECTION I: PAYMENT AND PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____
as _____ principal, _____ and

Company of _____ as surety, are held and firmly bound unto the City of Madison, Wisconsin, in the sum of _____ (\$_____) Dollars, lawful money of the United States, for the payment of which sum to the City of Madison, we hereby bind ourselves and our respective executors and administrators firmly by these presents.

The condition of this Bond is such that if the above bounden shall on his/her part fully and faithfully perform all of the terms of the Contract entered into between him/herself and the City of Madison for the construction of:

**MONONA TERRACE ROOF GARDEN RESTROOMS ALTERATION
CONTRACT NO. 7565**

in Madison, Wisconsin, and shall pay all claims for labor performed and material furnished in the prosecution of said work, and save the City harmless from all claims for damages because of negligence in the prosecution of said work, and shall save harmless the said City from all claims for compensation (under Chapter 102, Wisconsin Statutes) of employees and employees of subcontractor, then this Bond is to be void, otherwise of full force, virtue and effect.

Signed and sealed this _____ day of _____

Countersigned:

Company Name (Principal)

Witness

President Seal

Secretary

Approved as to form:

Surety Seal

Salary Employee Commission

City Attorney

By _____
Attorney-in-Fact

This certifies that I have been duly licensed as an agent for the above company in Wisconsin under License No. _____ for the year 20_____, and appointed as attorney-in-fact with authority to execute this payment and performance bond which power of attorney has not been revoked.

Date

Agent Signature

SECTION J: PREVAILING WAGE RATES

PREVAILING WAGE RATE DETERMINATION

Issued by the State of Wisconsin
Department of Workforce Development
Pursuant to s. 66.0903, Wis. Stats.
Issued On: 1/7/2015

DETERMINATION NUMBER: 201500014

EXPIRATION DATE: Prime Contracts MUST Be Awarded or Negotiated On Or Before 12/31/2015. If NOT, You MUST Reapply.

PROJECT NAME: ALL PUBLIC WORKS PROJECTS UNDER SEC. 66.0903, STATS-CITY OF MADISON

PROJECT LOCATION: MADISON CITY, DANE COUNTY, WI

CONTRACTING AGENCY: CITY OF MADISON - ENGINEERING

CLASSIFICATION:	Contractors are responsible for correctly classifying their workers. Either call the Department of Workforce Development (DWD) with trade or classification questions or consult DWD's Dictionary of Occupational Classifications & Work Descriptions on the DWD website at: dwd.wisconsin.gov/er/prevailing_wage_rate/Dictionary/dictionary_main.htm .
OVERTIME:	<p>Time and one-half must be paid for all hours worked:</p> <ul style="list-style-type: none">- over 10 hours per day on prevailing wage projects- over 40 hours per calendar week- Saturday and Sunday- on all of the following holidays: January 1; the last Monday in May; July 4; the 1st Monday in September; the 4th Thursday in November; December 25;- The day before if January 1, July 4 or December 25 falls on a Saturday;- The day following if January 1, July 4 or December 25 falls on a Sunday. <p>Apply the time and one-half overtime calculation to whichever is higher between the Hourly Basic Rate listed on this project determination or the employee's regular hourly rate of pay. Add any applicable Premium or DOT Premium to the Hourly Basic Rate before calculating overtime.</p> <p>A DOT Premium (discussed below) may supersede this time and one-half requirement.</p>
FUTURE INCREASE:	When a specific trade or occupation requires a future increase, you MUST add the full hourly increase to the "TOTAL" on the effective date(s) indicated for the specific trade or occupation.
PREMIUM PAY:	If indicated for a specific trade or occupation, the full amount of such pay MUST be added to the "HOURLY BASIC RATE OF PAY" indicated for such trade or occupation, whenever such pay is applicable.
DOT PREMIUM:	This premium only applies to highway and bridge projects owned by the Wisconsin Department of Transportation and to the project type heading "Airport Pavement or State Highway Construction." DO NOT apply the premium calculation under any other project type on this determination.
APPRENTICES:	Pay apprentices a percentage of the applicable journeyperson's hourly basic rate of pay and hourly fringe benefit contributions specified in this determination. Obtain the appropriate percentage from each apprentice's contract or indenture.
SUBJOURNEY:	Subjourney wage rates may be available for some of the trades or occupations indicated below with the exception of laborers, truck drivers and heavy equipment operators. Any employer interested in using a subjourney classification on this project MUST complete Form ERD-10880 and request the applicable wage rate from the Department of Workforce Development PRIOR to using the subjourney worker on this project.

This document **MUST BE POSTED** by the **CONTRACTING AGENCY** in at least one conspicuous and easily accessible place **on the site of the project**. A local governmental unit may post this document at the place normally used to post public notices if there is no common site on the project. This document **MUST** remain posted during the entire time any worker is employed on the project and **MUST** be physically incorporated into the specifications and all contracts and subcontracts. If you have any questions, please write to the Equal Rights Division, Labor Standards Bureau, P.O. Box 8928, Madison, Wisconsin 53708 or call (608) 266-6861.

The following statutory provisions apply to local governmental unit projects of public works and are set forth below pursuant to the requirements of s. 66.0903(8), Stats.

s. 66.0903 (1) (f) & s. 103.49 (1) (c) "PREVAILING HOURS OF LABOR" for any trade or occupation in any area means 10 hours per day and 40 hours per week and may not include any hours worked on a Saturday or Sunday or on any of the following holidays:

1. January 1.
2. The last Monday in May.
3. July 4.
4. The first Monday in September.
5. The 4th Thursday in November.
6. December 25.
7. The day before if January 1, July 4 or December 25 falls on a Saturday.
8. The day following if January 1, July 4 or December 25 falls on a Sunday.

s. 66.0903 (10) RECORDS; INSPECTION; ENFORCEMENT.

(a) Each contractor, subcontractor, or contractor's or subcontractor's agent performing work on a project of public works that is subject to this section shall keep full and accurate records clearly indicating the name and trade or occupation of every person performing the work described in sub. (4) and an accurate record of the number of hours worked by each of those persons and the actual wages paid for the hours worked.

s. 66.0903 (11) LIABILITY AND PENALTIES.

(a) 1. Any contractor, subcontractor, or contractor's or subcontractor's agent who fails to pay the prevailing wage rate determined by the department under sub. (3) or who pays less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor is liable to any affected employee in the amount of his or her unpaid wages or his or her unpaid overtime compensation and in an additional amount as liquidated damages as provided under subd. 2., 3., whichever is applicable.

2. If the department determines upon inspection under sub. (10) (b) or (c) that a contractor, subcontractor, or contractor's or subcontractor's agent has failed to pay the prevailing wage rate determined by the department under sub. (3) or has paid less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor, the department shall order the contractor to pay to any affected employee the amount of his or her unpaid wages or his or her unpaid overtime compensation and an additional amount equal to 100 percent of the amount of those unpaid wages or that unpaid overtime compensation as liquidated damages within a period specified by the department in the order.

3. In addition to or in lieu of recovering the liability specified in subd. 1. as provided in subd. 2., any employee for and in behalf of that employee and other employees similarly situated may commence an action to recover that liability in any court of competent jurisdiction. If the court finds that a contractor, subcontractor, or contractor's or subcontractor's agent has failed to pay the prevailing wage rate determined by the department under sub. (3) or has paid less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor, the court shall order the contractor, subcontractor, or agent to pay to any affected employee the amount of his or her unpaid wages or his or her unpaid overtime compensation and an additional amount equal to 100 percent of the amount of those unpaid wages or that unpaid overtime compensation as liquidated damages.

5. No employee may be a party plaintiff to an action under subd. 3. unless the employee consents in writing to become a party and the consent is filed in the court in which the action is brought. Notwithstanding s. 814.04 (1), the court shall, in addition to any judgment awarded to the plaintiff, allow reasonable attorney fees and costs to be paid by the defendant.

BUILDING OR HEAVY CONSTRUCTION

Includes sheltered enclosures with walk-in access for the purpose of housing persons, employees, machinery, equipment or supplies and non-sheltered work such as canals, dams, dikes, reservoirs, storage tanks, etc. A sheltered enclosure need not be "habitable" in order to be considered a building. The installation of machinery and/or equipment, both above and below grade level, does not change a project's character as a building. On-site grading, utility work and landscaping are included within this definition. Residential buildings of four (4) stories or less, agricultural buildings, parking lots and driveways are NOT included within this definition.

SKILLED TRADES

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
101	Acoustic Ceiling Tile Installer Future Increase(s): Add \$1.42/hr on 6/1/2015; Add \$1.42/hr on 6/1/2016.	32.72	16.00	48.72
102	Boilermaker Future Increase(s): Add \$1.50/hr. on 01/01/2016	33.35	28.24	61.59
103	Bricklayer, Blocklayer or Stonemason Future Increase(s): Add \$1.40 on 06/01/2015; Add \$1.45 on 06/06/2016 Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.82	18.66	51.48
104	Cabinet Installer Future Increase(s): Add \$1.42/hr on 6/1/2015; Add \$1.42/hr on 6/1/2016.	32.72	16.00	48.72
105	Carpenter Future Increase(s): Add \$1.42/hr on 6/1/2015; Add \$1.42/hr on 6/1/2016. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.72	16.00	48.72
106	Carpet Layer or Soft Floor Coverer Future Increase(s): Add \$1.42/hr on 6/1/2015; Add \$1.42/hr on 6/1/2016.	32.72	16.00	48.72
107	Cement Finisher	31.98	12.04	44.02
108	Drywall Taper or Finisher	26.05	18.23	44.28
109	Electrician Future Increase(s): Add \$1.20/hr on 6/1/15; Add \$1.25/hr on 6/1/16. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	34.82	19.67	54.49
110	Elevator Constructor	43.84	27.09	70.93

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
111	Fence Erector	18.00	6.09	24.09
112	Fire Sprinkler Fitter	36.79	18.81	55.60
113	Glazier Future Increase(s): Add \$.75/hr eff. 06/01/2015; Add \$.90/hr eff. 06/01/2016	37.07	14.42	51.49
114	Heat or Frost Insulator	33.43	25.81	59.24
115	Insulator (Batt or Blown) Future Increase(s): Add \$1.42/hr on 6/1/2015; Add \$1.42/hr on 6/1/2016.	32.72	16.00	48.72
116	Ironworker	31.50	20.01	51.51
117	Lather	31.40	15.90	47.30
118	Line Constructor (Electrical)	39.50	17.73	57.23
119	Marble Finisher	16.25	2.32	18.57
120	Marble Mason	32.09	18.04	50.13
121	Metal Building Erector	19.05	8.08	27.13
122	Millwright Future Increase(s): Add \$1.47/hr on 6/1/2015; Add \$1.47/hr on 6/1/2016.	34.44	16.07	50.51
123	Overhead Door Installer	27.46	1.98	29.44
124	Painter	25.75	16.60	42.35
125	Pavement Marking Operator	30.10	17.34	47.44
126	Piledriver Future Increase(s): Add \$1.50/hr on 6/1/2015; Add \$1.60/hr on 6/1/2016. Premium Increase(s): Add \$.65/hr for Piledriver Loftsman; Add \$.75/hr for Sheet Piling Loftsman. DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	30.11	26.51	56.62
127	Pipeline Fuser or Welder (Gas or Utility)	30.83	20.89	51.72
129	Plasterer Future Increase(s): Add \$1.56 on 06/01/2015; Add \$1.61 on 06/01/2016; Add \$1.66 on 06/01/2017	32.65	19.36	52.01
130	Plumber Future Increase(s): Add \$1.80 on 6/1/15	37.57	17.47	55.04

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
132	Refrigeration Mechanic Future Increase(s): Add \$1.80 on 6/1/15	44.20	18.26	62.46
133	Rofer or Waterproofofer	29.40	11.31	40.71
134	Sheet Metal Worker	34.45	22.54	56.99
135	Steamfitter Future Increase(s): Add \$1.80/hr on 6/1/15.	44.20	18.26	62.46
137	Teledata Technician or Installer Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	22.50	12.74	35.24
138	Temperature Control Installer	42.95	15.04	57.99
139	Terrazzo Finisher	16.25	2.32	18.57
140	Terrazzo Mechanic	31.18	17.35	48.53
141	Tile Finisher	23.85	17.18	41.03
142	Tile Setter	29.81	17.18	46.99
143	Tuckpointer, Caulker or Cleaner	23.60	7.10	30.70
144	Underwater Diver (Except on Great Lakes)	35.40	15.90	51.30
146	Well Driller or Pump Installer	25.32	15.65	40.97
147	Siding Installer	36.17	19.44	55.61
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	30.16	15.11	45.27
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	31.60	26.76	58.36
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	27.65	14.49	42.14
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	27.83	15.01	42.84
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.90	9.83	31.73

TRUCK DRIVERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
201	Single Axle or Two Axle	32.89	18.96	51.85
203	Three or More Axle	18.00	21.99	39.99

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	33.69	19.78	53.47
205	Pavement Marking Vehicle	20.85	11.02	31.87
207	Truck Mechanic	18.00	21.99	39.99

LABORERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
301	General Laborer Future Increase(s): Add \$1.35/hr eff. 06/01/2015; Add \$1.25/hr eff. 06/06/2016 Premium Increase(s): Add \$1.00/hr for certified welder; Add \$.25/hr for mason tender	24.97	15.12	40.09
302	Asbestos Abatement Worker	18.00	9.58	27.58
303	Landscaper	18.75	10.26	29.01
310	Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	21.55	14.14	35.69
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased) Premium Increase(s): DOT PREMIUMS: Pay two times the hourly basic rate on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	18.82	14.16	32.98
314	Railroad Track Laborer	14.50	5.29	19.79
315	Final Construction Clean-Up Worker Future Increase(s): Add \$1.35/hr eff. 06/01/2015; Add \$1.25/hr eff. 06/06/2016	24.97	15.12	40.09

**HEAVY EQUIPMENT OPERATORS
SITE PREPARATION, UTILITY OR LANDSCAPING WORK ONLY**

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked				
CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
		\$	\$	\$
501	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Milling Machine; Boring Machine (Directional, Horizontal or Vertical); Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Backhoe (Track Type) Having a Mfgr's Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Crane, Shovel, Dragline, Clamshells; Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Grader or Motor Patrol; Master Mechanic; Mechanic or Welder; Robotic Tool Carrier (With or Without Attachments); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Tractor (Scraper, Dozer, Pusher, Loader); Trencher (Wheel Type or Chain Type Having Over 8 Inch Bucket). Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	33.69	19.78	53.47
502	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Environmental Burner; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Jeep Digger; Screed (Milling Machine); Skid Rig; Straddle Carrier or Travel Lift; Stump Chipper; Trencher (Wheel Type or Chain Type Having 8 Inch Bucket & Under). Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	33.69	19.78	53.47
503	Air Compressor (&/or 400 CFM or Over); Augers (Vertical & Horizontal); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Crusher, Screening or Wash Plant; Farm or Industrial Type Tractor; Forklift; Generator (&/or 150 KW or Over); Greaser; High Pressure Utility Locating Machine (Daylighting Machine); Mulcher; Oiler; Post Hole Digger or Driver; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	31.62	19.78	51.40
504	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	41.65	21.71	63.36
505	Work Performed on the Great Lakes Including Crane or Backhoe Operator; Assistant Hydraulic Dredge Engineer; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder; 70 Ton & Over Tug Operator. Premium Increase(s): Add \$.50/hr for Friction Crane, Lattice Boom or Crane Certification (CCO).	41.65	21.71	63.36

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked				
CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
		\$	\$	\$
506	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	35.72	17.85	53.57
507	Work Performed on the Great Lakes Including Deck Equipment Operator, Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under); Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks - Great Lakes ONLY.	35.46	20.40	55.86

**HEAVY EQUIPMENT OPERATORS
EXCLUDING SITE PREPARATION, UTILITY, PAVING LANDSCAPING WORK**

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked				
CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
		\$	\$	\$
508	Boring Machine (Directional); Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic. Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016. Premium Increase(s): Add \$.50/hr for >200 Ton; Add \$1/hr at 300 Ton; Add \$1.50/hr at 400 Ton; Add \$2/hr at 500 Ton & Over.	36.67	19.78	56.45
509	Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Boring Machine (Horizontal or Vertical); Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With A Lifting Capacity Of 4,000 Lbs. & Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Pile Driver; Versi Lifts, Tri-Lifts & Gantrys (20,000 Lbs. & Over). Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016. Premium Increase(s): Add \$.25/hr for all >45 Ton lifting capacity cranes.	35.42	19.78	55.20
510	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump (Over 46 Meter), Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Dredge (NOT Performing Work on the Great Lakes); Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Hydro-Blaster (10,000 PSI or Over); Milling Machine; Skid Rig; Traveling Crane (Bridge Type). Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	34.22	19.78	54.00

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
511	Air, Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Pump (46 Meter & Under), Concrete Conveyor (Rotec or Bidwell Type); Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Environmental Burner; Gantrys (Under 20,000 Lbs.); Grader or Motor Patrol; High Pressure Utility Locating Machine (Daylighting Machine); Manhoist; Material or Stack Hoist; Mechanic or Welder; Railroad Track Rail Leveling Machine, Tie Placer, Extractor, Tamper, Stone Leveler or Rehabilitation Equipment; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yd or More Capacity; Screed (Milling Machine); Sideboom; Straddle Carrier or Travel Lift; Tining or Curing Machine; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type Having Over 8-Inch Bucket). Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	33.69	19.78	53.47
512	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Finishing Machine (Road Type); Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Grout Pump; Hoist (Tugger, Automatic); Industrial Locomotives; Jeep Digger; Lift Slab Machine; Mulcher; Roller (Rubber Tire, 5 Ton or Under); Screw or Gypsum Pumps; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Stump Chipper; Trencher (Wheel Type or Chain Type Having 8-Inch Bucket & Under); Winches & A-Frames. Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	31.62	19.78	51.40
513	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Boatmen (NOT Performing Work on the Great Lakes); Boiler (Temporary Heat); Crusher, Screening or Wash Plant; Elevator; Farm or Industrial Type Tractor; Fireman (Asphalt Plant NOT Performing Work on the Great Lakes); Forklift; Generator (&/or 150 KW or Over); Greaser; Heaters (Mechanical); Loading Machine (Conveyor); Oiler; Post Hole Digger or Driver; Prestress Machine; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Robotic Tool Carrier (With or Without Attachments); Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	30.99	19.78	50.77
514	Gas or Utility Pipeline, Except Sewer & Water (Primary Equipment). Future Increase(s): Add \$1/hr on 6/1/2015; Add \$1/hr on 5/30/2016.	36.34	22.14	58.48
515	Gas or Utility Pipeline, Except Sewer & Water (Secondary Equipment). Future Increase(s): Add \$1.65/hr on 6/1/2015.	33.12	19.35	52.47
516	Fiber Optic Cable Equipment	28.89	17.95	46.84

SEWER, WATER OR TUNNEL CONSTRUCTION

Includes those projects that primarily involve public sewer or water distribution, transmission or collection systems and related tunnel work (excluding buildings).

SKILLED TRADES

CODE	TRADE OR OCCUPATION	Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		
		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
		\$	\$	\$
103	Bricklayer, Blocklayer or Stonemason	32.09	18.04	50.13
105	Carpenter Future Increase(s): Add \$1.50/hr on 6/1/2015; Add \$1.65/hr on 6/1/2016. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	34.13	20.61	54.74
107	Cement Finisher Future Increase(s): Add \$1.87 on 6/1/15; Add \$1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	35.18	16.78	51.96
109	Electrician Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	33.93	22.77	56.70
111	Fence Erector	18.00	6.09	24.09
116	Ironworker	31.50	20.01	51.51
118	Line Constructor (Electrical)	39.50	17.73	57.23
125	Pavement Marking Operator	30.10	17.34	47.44
126	Piledriver	29.56	25.71	55.27
130	Plumber	21.50	0.00	21.50
135	Steamfitter	42.95	17.81	60.76
137	Teledata Technician or Installer	22.25	12.24	34.49
143	Tuckpointer, Caulker or Cleaner	23.60	7.10	30.70
144	Underwater Diver (Except on Great Lakes)	35.40	15.90	51.30

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
146	Well Driller or Pump Installer	25.32	15.65	40.97
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.55	15.57	51.12
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	31.60	15.19	46.79
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	27.65	13.44	41.09
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.68	13.28	38.96
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.75	12.97	34.72

TRUCK DRIVERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
201	Single Axle or Two Axle Future Increase(s): Add \$1.15/hr on 6/1/2015. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	25.18	18.31	43.49
203	Three or More Axle	19.50	4.97	24.47
204	Articulated, Euclid, Dumptor, Off Road Material Hauler	32.89	18.96	51.85
205	Pavement Marking Vehicle	20.85	11.02	31.87
207	Truck Mechanic	19.50	4.97	24.47

LABORERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
301	General Laborer Future Increase(s): Add \$1.35/hr eff. 06/01/2015; Add \$1.25/hr eff. 06/06/2016 Premium Increase(s): Add \$.20 for blaster, bracer, manhole builder, caulker, bottomman and power tool; Add \$.55 for pipelayer; Add \$1.00 for tunnel work 0-15 lbs. compressed air; Add \$2.00 for over 15-30 lbs. compressed air; Add \$3.00 for over 30 lbs. compressed air.	26.34	15.13	41.47
303	Landscaper	39.43	0.00	39.43

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
304	Flagperson or Traffic Control Person	31.95	0.00	31.95
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	18.33	13.65	31.98
314	Railroad Track Laborer	14.50	5.29	19.79

**HEAVY EQUIPMENT OPERATORS
SEWER, WATER OR TUNNEL WORK**

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
521	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity Of Over 4,000 Lbs., Crane With Boom Dollies; Master Mechanic; Pile Driver. Future Increase(s): Add \$1.55/hr on 6/1/2015. Premium Increase(s): Add \$.25/hr for operating tower crane.	37.24	20.10	57.34
522	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Boring Machine (Directional); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump (Over 46 Meter), Concrete Conveyor (Rotec or Bidwell Type); Concrete Spreader & Distributor; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With a Lifting Capacity of 4,000 Lbs. & Under; Dredge (NOT Performing Work on the Great Lakes); Milling Machine; Skid Rig; Telehandler; Traveling Crane (Bridge Type). Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	34.22	19.78	54.00
523	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Boring Machine (Horizontal or Vertical); Bulldozer or Endloader (Over 40 hp); Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Concrete Pump (46 Meter & Under), Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Gradall (Cruz-Aire Type); Grader or Motor Patrol; Hydro-Blaster (10,000 PSI or Over); Manhoist; Material or Stack Hoist; Mechanic or Welder; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yd or More Capacity; Screed (Milling Machine); Sideboom; Straddle Carrier or Travel Lift; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type Having Over 8-Inch Bucket). Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	33.69	19.78	53.47

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
524	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Finishing Machine (Road Type); Environmental Burner; Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Hoist (Tugger, Automatic); Grout Pump; Jeep Digger; Lift Slab Machine; Mulcher; Power Subgrader; Pump (3 Inch or Over) or Well Points; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Screw or Gypsum Pumps; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Stump Chipper; Tining or Curing Machine; Trencher (Wheel Type or Chain Type Having 8-Inch Bucket & Under); Winches & A-Frames.	30.82	18.96	49.78
525	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Crusher, Screening or Wash Plant; Farm or Industrial Type Tractor; Fireman (Asphalt Plant NOT Performing Work on the Great Lakes); Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Loading Machine (Conveyor); Post Hole Digger or Driver; Refrigeration Plant or Freeze Machine; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack.	30.69	18.46	49.15
526	Boiler (Temporary Heat); Forklift; Greaser; Oiler.	30.19	18.96	49.15
527	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	41.65	21.71	63.36
528	Work Performed on the Great Lakes Including 70 Ton & Over Tug Operator; Assistant Hydraulic Dredge Engineer; Crane or Backhoe Operator; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder.	41.65	21.71	63.36
529	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	35.72	17.85	53.57
530	Work Performed on the Great Lakes Including Deck Equipment Operator; Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under), Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks - Great Lakes ONLY.	35.46	20.40	55.86

AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION

Includes all airport projects (excluding buildings) and all projects awarded by the Wisconsin Department of Transportation (excluding buildings).

SKILLED TRADES

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
103	Bricklayer, Blocklayer or Stonemason	32.09	18.04	50.13
105	Carpenter Future Increase(s): Add \$1.42/hr on 6/1/2015; Add \$1.42/hr on 6/1/2016. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.72	16.00	48.72
107	Cement Finisher Future Increase(s): Add \$1.87 on 6/1/15; Add \$1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	35.18	16.78	51.96
109	Electrician Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	33.93	22.77	56.70
111	Fence Erector	18.00	6.09	24.09
116	Ironworker	31.50	20.01	51.51
118	Line Constructor (Electrical)	39.50	17.73	57.23
124	Painter	26.65	13.10	39.75
125	Pavement Marking Operator	29.22	25.90	55.12
126	Piledriver Future Increase(s): Add \$1.44/hr on 6/1/2015; Add \$1.44/hr on 6/1/2016. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	33.24	16.00	49.24
133	Rofer or Waterproofer	29.40	11.31	40.71

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
137	Teledata Technician or Installer	22.25	12.24	34.49
143	Tuckpointer, Caulker or Cleaner	23.60	7.10	30.70
144	Underwater Diver (Except on Great Lakes)	35.40	15.90	51.30
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.55	15.57	51.12
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	31.60	15.29	46.89
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	27.65	13.44	41.09
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.68	12.83	38.51
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.73	12.17	33.90

TRUCK DRIVERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
201	Single Axle or Two Axle Future Increase(s): Add \$1.15/hr on 6/1/2015. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	25.18	18.31	43.49
203	Three or More Axle Future Increase(s): Add \$1.15/hr on 6/1/2015. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	25.28	18.31	43.59
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm .	30.27	21.15	51.42
205	Pavement Marking Vehicle	23.16	21.13	44.29
206	Shadow or Pilot Vehicle	24.37	17.77	42.14

207	Truck Mechanic	24.52	17.77	42.29
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LABORERS

Fringe Benefits Must Be Paid On All Hours Worked

<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u> \$	<u>HOURLY FRINGE BENEFITS</u> \$	<u>TOTAL</u> \$
301	General Laborer Future Increase(s): Add \$1.05/hr eff. 06/01/2015; Add \$1.00/hr eff. 06/01/2016; Add \$1.00/hr eff. 06/01/2017 Premium Increase(s): Add \$.10/hr for topman, air tool operator, vibrator or tamper operator (mechanical hand operated), chain saw operator and demolition burning torch laborer; Add \$.15/hr for bituminous worker (raker and luteman), formsetter (curb, sidewalk and pavement) and strike off man; Add \$.20/hr for blaster and powderman; Add \$.25/hr for bottomman; Add \$.35/hr for line and grade specialist; Add \$.45/hr for pipelayer. / DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	30.41	15.14	45.55
302	Asbestos Abatement Worker	18.00	9.58	27.58
303	Landscaper Future Increase(s): Add \$1.05/hr eff. 06/01/2015; Add \$1.00/hr eff. 06/01/2016; Add \$1.00/hr eff. 06/01/2017 Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	30.41	15.14	45.55
304	Flagperson or Traffic Control Person Future Increase(s): Add \$1.05/hr eff. 06/01/2015; Add \$1.00/hr eff. 06/01/2016; Add \$1.00/hr eff. 06/01/2017 Premium Increase(s):	26.76	15.14	41.90

Fringe Benefits Must Be Paid On All Hours Worked

<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u> \$	<u>HOURLY FRINGE BENEFITS</u> \$	<u>TOTAL</u> \$
	DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.25/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.			
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	18.33	13.65	31.98
314	Railroad Track Laborer	14.50	5.29	19.79

**HEAVY EQUIPMENT OPERATORS
AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION**

Fringe Benefits Must Be Paid On All Hours Worked

<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u> \$	<u>HOURLY FRINGE BENEFITS</u> \$	<u>TOTAL</u> \$
531	Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity Of Over 4,000 Lbs., Crane With Boom Dollies; Traveling Crane (Bridge Type). Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm .	37.72	21.15	58.87
532	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With A Lifting Capacity Of 4,000 Lbs., & Under; Dredge (NOT Performing Work on the Great Lakes); Licensed Boat Pilot (NOT Performing Work on the Great Lakes); Pile Driver. Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm .	37.22	21.15	58.37

Fringe Benefits Must Be Paid On All Hours Worked

<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u> \$	<u>HOURLY FRINGE BENEFITS</u> \$	<u>TOTAL</u> \$
533	<p>Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Heater, Planer & Scarifier; Asphalt Milling Machine; Asphalt Screed; Automatic Subgrader (Concrete); Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bituminous (Asphalt) Plant & Paver, Screed; Boatmen (NOT Performing Work on the Great Lakes); Boring Machine (Directional, Horizontal or Vertical); Bridge (Bidwell) Paver; Bulldozer or Endloader; Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Conveyor System; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump, Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane Wlth a Lifting Capacity of 25 Tons or Under; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Gradall (Cruz-Aire Type); Grader or Motor Patrol; Grout Pump; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Material or Stack Hoist; Mechanic or Welder; Milling Machine; Post Hole Digger or Driver; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Sideboom; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Straddle Carrier or Travel Lift; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Trencher (Wheel Type or Chain Type); Tube Finisher; Tugger (NOT Performing Work on the Great Lakes); Winches & A-Frames.</p> <p>Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017.</p> <p>Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm.</p>	36.72	21.15	57.87

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
534	<p>Belting, Burlap, Texturing Machine; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Asphalt Plant, Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Hoist (Tugger, Automatic); Jeep Digger; Joint Sawyer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler; Tining or Curing Machine.</p> <p>Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017.</p> <p>Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm.</p>	36.46	21.15	57.61
535	<p>Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Automatic Belt Conveyor & Surge Bin; Boiler (Temporary Heat); Concrete Proportioning Plant; Crusher, Screening or Wash Plant; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Mudjack; Oiler; Prestress Machine; Pug Mill; Pump (3 Inch or Over) or Well Points; Rock, Stone Breaker; Screed (Milling Machine); Stump Chipper; Tank Car Heaters; Vibratory Hammer or Extractor, Power Pack.</p> <p>Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017.</p> <p>Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm.</p>	36.17	21.15	57.32
536	Fiber Optic Cable Equipment.	28.89	17.95	46.84
537	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	41.65	21.71	63.36
538	Work Performed on the Great Lakes Including 70 Ton & Over Tug Operator; Assistant Hydraulic Dredge Engineer; Crane or Backhoe Operator; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder.	41.65	21.71	63.36

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	\$	\$	\$
539	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	35.72	17.85	53.57
540	Work Performed on the Great Lakes Including Deck Equipment Operator, Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under); Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks-Great Lakes ONLY.	35.46	20.40	55.86

LOCAL STREET OR MISCELLANEOUS PAVING CONSTRUCTION
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Includes roads, streets, alleys, trails, bridges, paths, racetracks, parking lots and driveways (except residential or agricultural), public sidewalks or other similar projects (excluding projects awarded by the Wisconsin Department of Transportation).

SKILLED TRADES

CODE	TRADE OR OCCUPATION	Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		
		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
		\$	\$	\$
103	Bricklayer, Blocklayer or Stonemason	32.09	18.04	50.13
105	Carpenter Future Increase(s): Add \$1.42/hr on 6/1/2015; Add \$1.42/hr on 6/1/2016. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.72	16.00	48.72
107	Cement Finisher Future Increase(s): Add \$1.87 on 6/1/15; Add \$1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	35.18	16.78	51.96
109	Electrician	35.72	19.17	54.89
111	Fence Erector	18.00	6.09	24.09
116	Ironworker	31.50	20.01	51.51
118	Line Constructor (Electrical)	39.50	17.73	57.23
124	Painter	25.75	16.60	42.35
125	Pavement Marking Operator	30.10	17.34	47.44
126	Piledriver	29.56	25.71	55.27
133	Rofer or Waterproofer	29.40	11.31	40.71
137	Teledata Technician or Installer	22.25	12.24	34.49
143	Tuckpointer, Caulker or Cleaner	23.60	7.10	30.70
144	Underwater Diver (Except on Great Lakes)	35.40	15.90	51.30
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.55	15.57	51.12

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	31.60	15.19	46.79
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	27.65	13.44	41.09
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.68	13.28	38.96
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.75	12.97	34.72

TRUCK DRIVERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
201	Single Axle or Two Axle Future Increase(s): Add \$1.15/hr on 6/1/2015. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	25.18	18.31	43.49
203	Three or More Axle	16.00	0.00	16.00
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	33.69	19.78	53.47
205	Pavement Marking Vehicle	20.85	11.02	31.87
206	Shadow or Pilot Vehicle	24.37	17.77	42.14
207	Truck Mechanic	16.00	0.00	16.00

LABORERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
301	General Laborer	29.32	12.44	41.76
303	Landscaper Future Increase(s): Add \$1.05/hr eff. 06/01/2015; Add \$1.00/hr eff. 06/01/2016; Add \$1.00/hr eff. 06/01/2017 Premium Increase(s):	30.13	15.14	45.27

Fringe Benefits Must Be Paid On All Hours Worked

<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u> \$	<u>HOURLY FRINGE BENEFITS</u> \$	<u>TOTAL</u> \$
	DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).			
304	Flagperson or Traffic Control Person	19.06	14.29	33.35
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	18.33	13.65	31.98
314	Railroad Track Laborer	14.50	5.29	19.79

**HEAVY EQUIPMENT OPERATORS
CONCRETE PAVEMENT OR BRIDGE WORK**

Fringe Benefits Must Be Paid On All Hours Worked

<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u> \$	<u>HOURLY FRINGE BENEFITS</u> \$	<u>TOTAL</u> \$
541	Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity Of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic. Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm .	37.72	21.15	58.87

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
542	<p>Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With a Lifting Capacity of 4,000 Lbs. & Under; Crane, Tower Crane Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Dredge (NOT Performing Work on the Great Lakes); Licensed Boat Pilot (NOT Performing Work on the Great Lakes); Pile Driver.</p> <p>Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017.</p> <p>Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm.</p>	37.22	21.15	58.37
543	<p>Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Automatic Subgrader (Concrete); Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Boring Machine (Directional, Horizontal or Vertical); Bridge (Bidwell) Paver; Bulldozer or Endloader; Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Conveyor System; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump, Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane With a Lifting Capacity of 25 Tons or Under; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Gradall (Cruz-Aire Type); Grader or Motor Patrol; Grout Pump; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Manhoist; Material or Stack Hoist; Mechanic or Welder; Milling Machine; Post Hole Digger or Driver; Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Sideboom; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Straddle Carrier or Travel Lift; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Trencher (Wheel Type or Chain Type); Tube Finisher; Tugger (NOT Performing Work on the Great Lakes); Winches & A-Frames.</p>	35.72	17.85	53.57

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
544	Backfiller; Belting, Burlap, Texturing Machine; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Jeep Digger; Joint Sawyer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler; Tining or Curing Machine. Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm .	36.46	21.15	57.61
545	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Automatic Belt Conveyor & Surge Bin; Boiler (Temporary Heat); Concrete Proportioning Plant; Crusher, Screening or Wash Plant; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Mudjack; Oiler; Prestress Machine; Pug Mill; Pump (3 Inch or Over) or Well Points; Rock, Stone Breaker; Screed (Milling Machine); Stump Chipper; Tank Car Heaters; Vibratory Hammer or Extractor, Power Pack.	35.17	20.40	55.57
546	Fiber Optic Cable Equipment.	28.89	17.95	46.84
547	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	41.65	21.71	63.36
548	Work Performed on the Great Lakes Including 70 Ton & Over Tug Operator; Assistant Hydraulic Dredge Engineer; Crane or Backhoe Operator; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder.	41.65	21.71	63.36
549	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or more); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	35.72	17.85	53.57
550	Work Performed on the Great Lakes Including Deck Equipment Operator; Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under); Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks - Great Lakes ONLY.	35.46	20.40	55.86

**HEAVY EQUIPMENT OPERATORS
ASPHALT PAVEMENT OR OTHER WORK**

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
551	Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self Erecting Tower Crane With a Lifting Capacity of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads and/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic.	36.72	20.40	57.12
552	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With a Lifting Capacity Of 4,000 Lbs. & Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Dredge (NOT Performing Work on the Great Lakes); Licensed Boat Pilot (NOT Performing Work on the Great Lakes); Pile Driver. Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm .	37.22	21.15	58.37
553	Air, Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Heater, Planer & Scarifier; Asphalt Milling Machine; Asphalt Screed; Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bituminous (Asphalt) Plant & Paver, Screed; Boring Machine (Directional, Horizontal or Vertical); Bulldozer or Endloader; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Laser/Screed; Concrete Slipform Placer Curb & Gutter Machine; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane With a Lifting Capacity of 25 Tons or Under; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Gradall (Cruz-Aire Type); Grader or Motor Patrol; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Manhoist; Material or Stack Hoist; Mechanic or Welder; Milling Machine; Post Hole Digger or Driver; Railroad Track Rail Leveling Machine, Tie Placer, Extractor, Tamper, Stone Leveler or Rehabilitation Equipment; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Sideboom; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Trencher (Wheel Type or Chain Type); Tube Finisher; Tugger (NOT Performing Work on the Great Lakes); Winches & A-Frames. Future Increase(s): Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.	33.69	19.78	53.47

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	<u>TOTAL</u>
<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	\$	\$	\$
554	Backfiller; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Asphalt Plant, Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Hoist (Tugger, Automatic); Jeep Digger; Joint Sawyer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Self-Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler. Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017.	36.17	20.80	56.97
555	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Automatic Belt Conveyor & Surge Bin; Boiler (Temporary Heat); Crusher, Screening or Wash Plant; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Mudjack; Oiler; Prestress Machine; Pug Mill; Pump (3 Inch or Over) or Well Points; Rock, Stone Breaker; Screed (Milling Machine); Stump Chipper; Tank Car Heaters; Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016; Add \$1.25/hr on 6/1/2017. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium. See DOT'S website for details about the applicability of this night work premium at: http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm .	36.17	21.15	57.32
556	Fiber Optic Cable Equipment.	27.89	17.20	45.09

RESIDENTIAL OR AGRICULTURAL CONSTRUCTION

Includes single family houses or apartment buildings of no more than four (4) stories in height and all buildings, structures or facilities that are primarily used for agricultural or farming purposes, excluding commercial buildings. For classification purposes, the exterior height of a residential building, in terms of stories, is the primary consideration. All incidental items such as site work, driveways, parking lots, private sidewalks, private septic systems or sewer and water laterals connected to a public system and swimming pools are included within this definition. Residential buildings of five (5) stories and above are NOT included within this definition.

SKILLED TRADES

<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	<u>HOURLY BASIC RATE OF PAY</u>	<u>HOURLY FRINGE BENEFITS</u>	<u>TOTAL</u>
		\$	\$	\$
101	Acoustic Ceiling Tile Installer	33.07	16.07	49.14
102	Boilermaker	32.05	28.04	60.09
103	Bricklayer, Blocklayer or Stonemason Future Increase(s): Add \$1.40 on 06/01/2015; Add \$1.45 on 06/06/2016 Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.82	18.66	51.48
104	Cabinet Installer	34.42	0.00	34.42
105	Carpenter	31.40	2.01	33.41
106	Carpet Layer or Soft Floor Coverer	30.00	0.00	30.00
107	Cement Finisher	24.08	0.00	24.08
108	Drywall Taper or Finisher	8.50	0.00	8.50
109	Electrician	20.00	6.62	26.62
110	Elevator Constructor	23.26	0.00	23.26
111	Fence Erector	16.00	3.76	19.76
112	Fire Sprinkler Fitter	39.00	18.00	57.00
113	Glazier Future Increase(s): Add \$.75/hr eff. 06/01/2015; Add \$.90/hr eff. 06/01/2016	37.07	14.42	51.49
114	Heat or Frost Insulator	33.43	25.81	59.24
115	Insulator (Batt or Blown)	23.00	10.55	33.55
116	Ironworker	31.50	20.01	51.51
117	Lather	31.40	2.01	33.41
119	Marble Finisher	16.25	2.32	18.57
120	Marble Mason	32.09	18.04	50.13

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
121	Metal Building Erector	18.00	5.88	23.88
123	Overhead Door Installer	16.65	1.03	17.68
124	Painter	25.75	8.94	34.69
125	Pavement Marking Operator	18.75	2.47	21.22
129	Plasterer	25.00	10.45	35.45
130	Plumber	30.00	10.44	40.44
132	Refrigeration Mechanic	17.00	13.56	30.56
133	Rofer or Waterproofer	15.00	1.37	16.37
134	Sheet Metal Worker	22.54	5.20	27.74
135	Steamfitter	23.62	16.12	39.74
137	Teledata Technician or Installer	18.00	28.48	46.48
138	Temperature Control Installer	22.00	1.62	23.62
139	Terrazzo Finisher	16.25	2.32	18.57
140	Terrazzo Mechanic	30.71	16.52	47.23
141	Tile Finisher	23.85	17.18	41.03
142	Tile Setter Future Increase(s): Add \$1.40/hr on 6/01/2015; Add \$1.45/hr on 6/06/2016.	31.55	18.26	49.81
143	Tuckpointer, Caulker or Cleaner	14.00	8.75	22.75
146	Well Driller or Pump Installer	12.75	9.50	22.25
147	Siding Installer	17.25	0.00	17.25

TRUCK DRIVERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
201	Single Axle or Two Axle	16.50	0.00	16.50
203	Three or More Axle	18.00	2.44	20.44
205	Pavement Marking Vehicle	20.85	11.02	31.87
207	Truck Mechanic	18.00	2.44	20.44

LABORERS

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
301	General Laborer	24.21	8.02	32.23
302	Asbestos Abatement Worker	16.50	8.21	24.71
303	Landscaper	12.00	0.00	12.00
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	18.33	13.65	31.98
315	Final Construction Clean-Up Worker	10.00	3.47	13.47

**HEAVY EQUIPMENT OPERATORS
RESIDENTIAL OR AGRICULTURAL CONSTRUCTION**

Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
557	Asphalt Heater, Planer & Scarifier; Asphalt Milling Machine; Asphalt Screed; Backhoe (Track Type); Backhoe (Mini, 15,000 Lbs. & Under); Bituminous (Asphalt) Plant & Paver, Screed; Boring Machine (Directional, Horizontal or Vertical); Bulldozer or Endloader; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Conveyor System; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump, Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane With a Lifting Capacity of 25 Tons or Under; Crane, Shovel, Dragline, Clamshells; Forestry Equipment, Timberco, Tree Shear, Tub Grinder, Processor; Grader or Motor Patrol; Grout Pump; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Manhoist; Material or Stack Hoist; Mechanic or Welder; Milling Machine; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type); Winches & A-Frames.	34.22	19.78	54.00

Future Increase(s):
Add \$1.60/hr on 6/2/2015; Add \$1.60/hr on 6/3/2016.

558	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Backfiller; Belting, Burlap, Texturing Machine; Boiler (Temporary Heat); Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Farm or Industrial Type Tractor; Forklift; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Jeep Digger; Lift Slab Machine; Mulcher; Oiler; Post Hole Digger or Driver; Power Subgrader; Pump (3 Inch or Over) or Well Points; Robotic Tool Carrier (With or Without Attachments); Rock, Stone Breaker; Roller (Rubber Tire, 5 Tons or Under); Screed (Milling Machine); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Stump Chipper; Telehandler; Vibratory Hammer or Extractor, Power Pack.	36.72	21.15	57.87
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Future Increase(s):

Add \$1.25/hr on 6/1/2015; Add \$1.30/hr on 6/1/2016;

Add \$1.25/hr on 6/1/2017.

Premium Increase(s):

DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day,

Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add \$1.50/hr night work premium.

See DOT'S website for details about the applicability of this night work premium at: <http://www.dot.wi.gov/business/civilrights/laborwages/pwc.htm>.

***** END OF RATES *****

PREVAILING WAGE – Contractors

Any public works project that has a total estimated project cost that equals or exceeds prevailing wage project thresholds requires a prevailing wage rate determination issued by the Department of Workforce Development (DWD). Public works include erecting, constructing, remodeling, repairing, demolishing, alterations, painting and decorating projects for a local governmental unit or state agency. State law excludes minor service or maintenance work, warranty work, or work under a supply-and-installation contract. There is a statutory definition for most of these exclusions. The prevailing wage laws that apply to local governmental units and their contractors are §§66.0903 and 103.503, Wis. Stats. The prevailing wage laws that apply to state agencies and their contractors are §§103.49 and 103.503, Wis. Stats. The applicable administrative rules for all prevailing wage projects are DWD 290 and DWD 294, Wis. Adm. Code. These laws include provisions that apply to all contractors and subcontractors working on prevailing wage projects.

Any contractor or subcontractor working on a local governmental unit or state agency's public works project that equals or exceeds current prevailing wage project thresholds must do all of the following:

- Receive and review the project's prevailing wage rate determination (i.e., white sheet).
- Tell subcontractors the project is subject to state prevailing wage law and include the prevailing wage rate determination in the construction contract, or if there is no written contract, provide a copy of the project determination to each subcontractor.
- Hire subcontractors who do *not* appear on the "Consolidated List of Debarred Contractors."
- Have a written substance abuse testing program in place that fulfills the requirements of §103.503, Wis. Stats., before commencing work on the project.

- Notify subcontractors that if DWD finds that a contractor or subcontractor violated the prevailing wage law, DWD will assess liquidated damages of 100% of the wages owed to employees.
- Apply to DWD for subjourney wage rates prior to employing these individuals on the project.
- Receive and retain a completed Affidavit of Compliance from each subcontractor brought on to the project before providing final payment to those subcontractors.
- Submit a completed Affidavit of Compliance to the contractor who brought the subcontractor on to the project before receiving final payment for the project.
- Maintain payroll records for 3 years that comply with §§66.0903(10)(a) or 103.49(5)(a), Stats. and DWD 274.06.
- Respond to requests from DWD or the project owner to provide payroll records and/or respond to prevailing wage complaints filed by employees or third parties.

For more information, visit the prevailing wage website: http://dwd.wisconsin.gov/er/prevailing_wage_rate/default.htm. For further assistance, call the Equal Rights Division at 608-266-6861 and ask for prevailing wage.