

BID OF _____

2015

PROPOSAL, CONTRACT, BOND AND SPECIFICATIONS

FOR

CCB CITY CHANNEL REMODEL

CONTRACT NO. 7311

PROJECT NO. 53W1756

MUNIS NO. 10574

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>

**CCB CITY CHANNEL REMODEL
CONTRACT NO. 7311**

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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:	CCB CITY CHANNEL REMODEL
CONTRACT NO.:	7311
SBE GOAL	14%
BID BOND	5%
PRE BID CONFERENCE (10:00 A.M.)	AUGUST 25, 2015
PRE BID MEETING (1:00 P.M.)	AUGUST 28, 2015
PREQUALIFICATION APPLICATION DUE (1:00 P.M.)	SEPTEMBER 4, 2015
BID SUBMISSION (1:00 P.M.)	SEPTEMBER 11, 2015
BID OPEN (1:30 P.M.)	SEPTEMBER 11, 2015
PUBLISHED IN WSJ	AUG. 14, 21, 28 & SEPT. 4

PRE-BID CONFERENCE: A pre-bid conference will be conducted at CCB Suite 340 10:00am, Tuesday August 25, 2015. Contractors can access the building from Martin Luther King Jr Blvd and take the elevator or stairs to the 3rd floor. Suite 340 is on the South West side of the building. There is limited street parking. The Dane County Parking Ramp on 113 S. Henry is two blocks from the project site.

This will be the only opportunity for bidding contractors to walk through the site

The City Project Manager will also be on hand to answer general contract questions.

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 CCB City Channel Remodel in the subject line.

The deadline for receiving questions and clarifications shall be 12:00pm (noon) on Tuesday September 1, 2015. No additional questions or requests for clarifications will be received after this deadline.

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.

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.

**CCB CITY CHANNEL REMODEL
CONTRACT NO. 7311**

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

**CCB CITY CHANNEL REMODEL
CONTRACT NO. 7311**

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

CCB CITY CHANNEL REMODEL CONTRACT NO. 7311

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 October 7, 2015. No exceptions or extensions to the above date will be permitted.

ARTICLE 104: SCOPE OF WORK

This contract is for the renovation of the existing offices in Suite 340 of the City-County Building to accommodate City Channel offices and recording studio. The project also includes improvements to the adjoining Shared Resource Planning offices.

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 Suite 340 offices, located at 210 Martin Luther King Blvd. The suite consists of multiple offices within the suite. The exterior project limits are very limited but should allow for the safe and efficient execution of work related to the renovation of City Channel offices, recording studio, and SRP offices. See Cooperation of the Contractor for additional information and requirements.

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, Mechanical, and Electrical plans
 - 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.

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, and 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 Contractor shall be responsible for the sequencing of the project however all of the following shall apply:

- The SRP Server Room electrical supply shall not be interrupted at any time (except when scheduling the backup power system installation) and shall remain operational throughout the project.
- The SRP office space shall remain operational at all times with lights, power, ventilation, heat and air conditioning except for the period required to remodel the SRP space. The SRP Office space shall be completely remodeled in three (3) weeks.

- Provide scheduling to the City Project Manager, Project Architect and Dane County Facility Management for access to all contract related spaces outside of Suite 340. This shall include public hall way and other City/County owned office spaces.
 - Provide an anticipated work schedule including number of people, type of access, equipment and duration. Schedule shall be supplied at least five (5) working days prior to the date access will be required.
 - All tools, equipment, and materials shall be mobile and shall be removed back to Suite 340 at the end of each work day.
 - All adjacent spaces will be hermetically sealed to minimize dust and debris from entering adjacent office spaces. Any common areas including but not limited to hallways, freight elevator and shall be cleaned of dust and debris at the end of each work day.

The Contractor shall coordinate, building access, elevator access, and dumpster locations directly with Dane County Facility Management. Dane County facility Management will allow one dumpster location at the South West corner of the building (Wilson Street). No off-street parking will be available, only temporary street offloading will be acceptable. The freight elevator will be available for contractor use on a limited basis. Public elevators are not available for contractor use.

Temporary Street or sidewalk closure permits may be available. Contractor will be responsible for all costs and requirements for obtaining a permit at the building inspection permit counter.

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:

- See Specification 01 76 00-Protecting Installed construction for more information.
- All damage, not consistent with requirements of the contract documents shall be repaired or replaced to the original or better condition at the Contractor's expense.
- The Contractor shall be responsible for protecting all mature trees including limbs and branches during exterior construction activities. This shall include but not be limited to locating and removing dumpsters, making deliveries of materials and other related work. The Contractor shall replace any damaged tree with similar specimen and size as directed by the City of Madison 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. See Specification 00 31 46 Permits for more information.

SECTION 109.7: TIME OF COMPLETION

Work shall begin only after the contract is completely executed and the start work letter is received. It is anticipated that the start work letter shall be issued on or about October 26, 2015.

The Contractor shall review Specifications 01 29 76 Progress Payment Procedures and 01 77 00 Closeout Procedures and be completely familiar with progress payment milestones and definitions related to construction closeout and contract closeout.

The Contractor shall have reached a level of Construction Closeout **NO LATER THAN May 20, 2016**. This milestone by definition in the specifications includes Owner Occupancy of all City Channel and SRP related spaces.

The Contractor shall have reached a level of Contract Closeout **NO LATER THAN June 17th, 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, 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

Contractors with questions and concerns regarding the bidding of these contract documents shall contact the Project Architect by email so we may properly log, track and respond to all issues.

* Reference CCB-City Channel Remodel Contract 7311 in the subject line of all emails

The Project Architects for this contract are:

Melissa Destree
Destree Design Architects, Inc.
222 West Washington Ave #310
Madison, WI 53703
Email: melissa@destreearchitects.com

Jeff Spruill, AIA, NCARB
Destree Design Architects, Inc.
222 West Washington Ave #310
Madison, WI 53703
Email: jspruill@destreearchitects.com

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

James Whitney
Facility Management and Sustainability
PH: (608) 266-4563
Email: JWhitney@cityofmadison.com

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

Mike Schuchardt
Facility Management and Sustainability
PH: (608) 261-9249
Email: MSchuchardt@cityofmadison.com

CITY-COUNTY BUILDING
CITY CHANNEL REMODEL
CITY OF MADISON CONTRACT: 7310

TECHNICAL SPECIFICATIONS
08.14.2015

Prepared by:

Destree Design Architects, Inc.
222 West Washington Ave. #310
Madison, WI 53703
608.268.1499

Hein Engineering Group
319 West Beltline Hwy
Madison, WI 53713
608.288.9260

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**SECTION 00 31 46
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11 **PART 1 – GENERAL**

12
13 **1.1. SUMMARY**

- 14 A. Each project has varying requirements for permits, inspections, and fees based on the scope, size, and location of
15 the project.
16 B. The City of Madison (Owner) is subject to all permits, inspections and associated fees for construction,
17 demolition, utility connection, storm water management, and other similar requirements that may be required
18 to complete the scope of work associated with these contract documents.
19 C. The General Contractor (GC) shall be responsible for obtaining all permits, inspections and paying for all
20 associated fees unless specifically identified within this specification.
21

22 **1.2. REFERENCES**

- 23 A. The following references are not intended to be all inclusive. It shall be the GC’s responsibility to determine all
24 requirements based on the scope of work in the contract documents.
25 B. City of Madison Ordinances: Review all ordinances that may require a permit or fee that may be connected with
26 a required permit. Contact the following City Agencies to determine the exact requirements during bidding
27 1. Building Inspection
28 2. Zoning
29 3. Engineering
30 4. Water Utility
31 5. Traffic Engineering
32 6. Others as may be specified by the contract documents.
33 B. State Statutes
34 C. Other Regulatory Regulations
35 D. Other Agencies or companies that may have related requirements
36 1. Madison Metropolitan Sewerage District
37 2. Local gas and electric utility companies
38 3. Other utility companies
39

40 **1.3. GENERAL CONTRACTORS REQUIREMENTS**

- 41 A. The GC shall be responsible for all of the following:
42 1. Execute application for all required permits as may be required by the scope of work described within the
43 contract documents.
44 2. Paying all fees associated with the application of any required permits.
45 3. Scheduling all required inspections that may be conditions of any required permits.
46 B. The GC shall provide high quality scanned images of all required permits and inspections and upload them to the
47 Contract Documents-Regulatory Documents Library on the Project Management Web Site.
48

49 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

50
51 **PART 3 – EXECUTION – THIS SECTION NOT USED**

52
53
54
55 **END OF SECTION**

SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

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PART 1 – GENERAL

1.1. SUMMARY

- 17 A. The City of Madison uses a specific list of preferred products for various specification items to establish
18 standards of quality, utility, and appearance required.
19 B. The City of Madison will not allow substitutions for specified Products except as follows:
20 1. The Product is no longer produced or the product manufacturer is no longer in business.
21 2. The manufacturer has significantly changed performance data, product dimensions, or other such design
22 criteria for the specified Product(s).
23 3. Products specified by naming one or more Products or manufacturer’s and “or approved equal” or
24 “approved equivalent.”
25 C. The City of Madison will not allow substitutions for specified Products as follows:
26 1. For Products specified by naming only one Product and manufacturer, no substitute product will be
27 considered.
28 2. For Products specified by naming several Products or manufacturers select any one of the products or
29 manufacturers named, which complies with the specifications. No substitute product will be considered.
30 D. Request for substitutions from any party other than the General Contractor (GC) will not be accepted.
31

1.2. RELATED SPECIFICATIONS

- 33 A. Section 01 26 13 Request for Information (RFI)
34 B. Section 01 31 23 Project Management Web Site
35 C. Section 01 33 23 Submittals
36

PART 2 – PRODUCTS

2.1. SUBSTITUTION REQUEST FORM

- 40 A. During bidding all contractors (General and Sub-contractors) and suppliers of materials or products shall provide
41 hard copy of the Substitution Request form and all required attachments directly to the Project Architect.
42 Submission shall use the form located at the end of this specification.
43 1. Contractors and suppliers shall use the screen shot of the form located at the end of this specification to
44 print a hard copy for all pre-bid substitution requests.
45 B. After bidding only the GC shall submit a request and shall use the form located on the Project Management Web
46 Site.
47

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

- 51 A. In the event that a substitution is requested during the bidding phase the Contractor or Supplier shall meet the
52 substitution request deadline listed in the bidding documents. No substitution request will be considered during
53 the bidding period after the stated substitution request deadline. In general this procedure shall be as follows:
54 1. Submit the Substitution Request Form including all required supporting documentation to the City
55 Project Manager and Project Architect by the substitution request deadline specified in Section A of the
56 Contract Documents. Utilize the Substitution Request Form found at the end of this Section.
57 2. Submit a Substitution Request Form for each product, supported with complete data, drawings and
58 samples as appropriate, including:

- 1 i. Comparison of qualities of the proposed substitutions with that specified.
- 2 ii. Changes required in other elements of the Work because of the substitution.
- 3 iii. Effect on the construction schedule.
- 4 iv. Cost data comparing the proposed substitution with the Product specified.
- 5 v. Any required license fees or royalties.
- 6 vi. Availability of maintenance service and source of replacement materials.
- 7 3. The Owner and Architect will review the Substitution Request Form and if approved the City of Madison
- 8 will publish a bidding addendum authorizing the replacement. The Owner and Architect may reject any
- 9 substitution request without providing specific reasons.
- 10 B. Substitutions submitted and approved during the bidding phase shall be announced by the City of Madison by
- 11 addenda prior to the bid due date.
- 12

13 **3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT**

- 14 A. A substitution request will only be considered after award of contract if it meets the qualifying provisions as
- 15 described in 1.1.B.1 and .2 above.
- 16 B. The GC shall submit a substitution request using the digital form on the Project Management Web Site located in
- 17 the Construction Administration-Substitution Request library.
- 18 1. Click on *Add document* to open a new digital form, fill out form, provide required attachments, then click
- 19 the Submit button.
- 20 2. Consulting Staff, Owner and Owners Representatives will review the request and provide the appropriate
- 21 approvals and feed back to the GC.
- 22

23 **3.3. UNAUTHORIZED SUBSTITUTIONS**

- 24 A. Any Contractor who substitutes products without proper authorization by the Owner and Architect will be
- 25 required to immediately remove and replace the product and all costs required to conform to the Contract
- 26 Documents shall be borne by the General Prime Contractor.
- 27
- 28
- 29

30 **END OF SECTION**

31



Substitution Request

Today's Date:

Project Title:

Project Number:

Contract Number:

Description	Spec Section	Page	Paragraph
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

The undersigned requests consideration of the following:

Proposed Substitution:

Attachments

[Click here to attach a file](#)

Insert item

- Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.
- Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned General Contractor representative certifies that the following paragraphs are correct.

1. The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.
2. The proposed substitution does not affect dimensions shown on drawings.
3. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the request.
4. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
5. Maintenance and service parts will be locally available for the proposed substitution. Provide supporting documentation.

Submitted By:

By typing my name and entering the date I hereby give my electronic signature

Name: Title: Date:

Firm: Address:

Phone:

1
2
3
4
5

**SECTION 01 26 13
REQUEST FOR INFORMATION (RFI)**

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14 3.4. COMMENCEMENT OF WORK RELATED TO AN RFI 2
15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. Contractors shall use the RFI form/process to request additional information or clarification regarding the
20 construction documents.
21 B. All RFI documentation will be processed through the through the Construction Administration-Request for
22 Information Library on the Project Management Web Site (PMWS).
23

1.2. RELATED SPECIFICATIONS

- 24 A. Section 01 26 46 Construction Bulletin (CB)
25 B. Section 01 26 57 Change Order Request (COR)
26 C. Section 01 26 63 Change Order (CO)
27 D. Section 01 31 23 Project Management Web Site (PMWS)
28
29

1.3. PERFORMANCE REQUIREMENTS

- 30 A. RFI issues initiated by any contractor shall be done through the General Contractor (GC).
31 1. RFIs submitted by any Sub-contractor under the GCs control shall be returned with no response.
32 B. Submit a new RFI for each issue. Only multiple questions that are of a similar nature may be combined into one
33 RFI shall be allowed and responded to.
34
35

1.4. QUALITY ASSURANCE

- 36 A. The GC shall be responsible for all of the following:
37 1. Ensure that any request for additional information is valid and the information being requested is not
38 addressed in the construction documents.
39 2. Ensure that all requests are clearly stated and the RFI form is completely filled out.
40 3. Ensure that all Work associated an RFI response is carried out as intended.
41 B. The PA shall be responsible for the following:
42 1. Ensure that all responses to contractor initiated RFIs are properly responded to in a timely fashion.
43 a. The CPM, Owner, consulting staff, and other City staff shall be responsible for the initial review of
44 the RFI. The PA shall be responsible for codifying all consultant and Owner/City staff comments
45 into a unified RFI response.
46
47

PART 2 – PRODUCTS

2.1. REQUEST FOR INFORMATION FORM

- 48
49
50 A. The RFI form is located on the Project Management Web Site. The GC, PA, or CPM as appropriate shall click the
51 link in the left margin of the project web site opening a new form. Project information is pre-loaded, provide
52 additional information as indicated below in the execution to complete the form.
53
54

PART 3 - EXECUTION

1 **3.1. CONTRACTOR INITIATED RFI**

- 2 A. Immediately on discovery of the need for additional information or interpretation of the Contract Documents
3 any contractor may initiate an RFI for additional information or clarification through the GC.
4 B. The GC shall select the "Submit an RFI" link on the Project Management Web Site and completely fill out the
5 form as follows:
6 1. Contract related information will be automatically populated on the form.
7 2. Thoroughly explain the issue at hand, provide backup information (photographs, sketches, drawings,
8 data, etc) as necessary, and clearly state the question or problem that requires a resolution. Combine
9 like or related issues but do not include multiple issues on one form.
10 a. Example. If a duct interferes with other critical piping and electrical work include all issues into
11 one RFI.
12 b. Example. If you have a question regarding the chiller and another regarding toilet partitions
13 create separate RFIs.
14 3. Check all relevant boxes for trades affected. This will assist the design team in determining who should
15 be reviewing the RFI.
16 C. Upon completing the RFI click the "Submit" button. The PMWS software will automatically route the RFI to the
17 appropriate reviewers.
18

19 **3.3. RFI RESPONSES**

- 20 A. Responses to simple RFI issues shall use the response section of the RFI form and shall be completed within five
21 (5) working days of the RFI form being submitted.
22 B. Responses to more complex issues may require additional time or may require a Construction Bulletin to be
23 published. The initial RFI shall be responded to within five (5) working days stating that the RFI is being
24 reviewed and provide an estimated date for the response.
25 C. The following GC generated RFIs will be returned without action:
26 1. Requests for approval of submittals
27 2. Requests for approval of substitutions
28 3. Requests for approval of Contractor's means and methods.
29 4. Requests for coordination information already indicated in the Contract Documents.
30 5. Requests for adjustments in the Contract Time or the Contract Sum.
31 6. Requests for interpretation of A/E's actions on submittals.
32 7. Incomplete RFI or inaccurately prepared RFI.
33

34 **3.4. COMMENCEMENT OF WORK RELATED TO AN RFI**

- 35 A. The GC shall only proceed with the Work of an RFI where, additional information is notbe required..
36 B. The GC shall not proceed with any Work associated with an RFI while it is under review.
37 C. The GC shall not proceed with any Work associated with an RFI that clearly states a CB will be issued in response
38 to the RFI.
39 D. The GC will be required to immediately remove and replace unauthorized Work and all costs required to
40 conform to the Contract Documents shall be borne by the GC.
41
42
43

44 **END OF SECTION**
45

**SECTION 01 26 46
CONSTRUCTION BULLETIN (CB)**

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14

PART 1 – GENERAL

1.1. SUMMARY

- 18 A. Construction Bulletins (CB) are formal published construction documents that modify the original contract bid
19 documents after construction has commenced. CBs may be published for many reasons, including but not
20 limited to the following:
21 1. Clarification of existing construction documents including specifications, plans, and details
22 2. Change in product or equipment
23 3. A response to a Request for Information
24 4. Change in scope of the contract as either an add or a deduct of work
25 B. CBs provide a higher degree of detail in response to a Request for Information (RFI) through directives, revised
26 plans/details, and specifications as necessary.
27 C. The CB may change the original contract documents through additions or deletions to the Work.
28 D. Where the directives of a CB are significant enough to warrant a Change Order Request (COR) the GC shall use all
29 information provided in the CB to assemble all required back-up documentation for additions and deletions of
30 materials, labor and other related contract costs for the COR.
31 E. All CB documentation will be processed through the through the Construction Administration-Construction
32 Bulletin Library on the Project Management Web Site (PMWS).
33

1.2. RELATED SPECIFICATIONS

- 34 A. Section 01 26 13 Request for Information (RFI)
35 B. Section 01 26 57 Change Order Request (COR)
36 C. Section 01 26 63 Change Order (CO)
37 D. Section 01 31 23 Project Management Web Site
38
39

1.3. PERFORMANCE REQUIREMENTS

- 40 A. Project Architect (PA): The PA shall be the only person authorized to publish a CB as needed for any reason
41 indicated in section 1.1.A above. The PA shall consult as necessary with any of the following while drafting the
42 CB and shall confirm final direction with the CPM prior to issuing a CB:
43 1. City Project manager (CPM)
44 2. Owner
45 3. Members of the consulting staff
46 4. Members of city staff
47 5. The General Contractor
48 6. Sub-contractors
49 B. General Contractor: The GC shall be responsible for the following as needed:
50 1. Executing the directives of the CB when he/she believes that no changes in labor, materials, equipment,
51 or contract duration will be required for additions or deletions.
52 2. Submit a COR when he/she believes that a change in labor, materials, equipment or contract duration
53 will be required for additions or deletions.
54
55

1.4. QUALITY ASSURANCE

- 56 A. The PA shall be responsible for ensuring the final CB sufficiently provides direction, details, specifications and
57 other information as necessary for the GC to perform the intended Work.
58

- 1 B. The PA shall be responsible for ensuring the final CB is published as expeditiously as practical based on the
2 complexity of the CB being written. CBs that may affect the GC critical path shall be given priority.
3

4 **PART 2 – PRODUCTS**

5
6 **2.1. CONSTRUCTION BULLETIN FORM**

- 7 A. The CB form is located on the Project Management Web Site. The PA shall click the link in the left margin of the
8 project web site opening a new form. Project information is pre-loaded, the PA only needs to enter information
9 and make attachments as needed to complete the form.
10

11 **PART 3 - EXECUTION**

12
13 **3.1. WRITING THE CONSTRUCTION BULLETIN**

- 14 A. The PA shall draft a CB as needed using the Construction Bulletin form on the Project Management Web Site.
15 1. The PA and/or consulting staff as necessary shall provide specifications, model numbers and performance
16 data, details and other such information necessary to clearly state the intentions of the CB.
17 2. The consulting staff, CPM, Owner, and other City Staff shall review the draft and recommend changes as
18 needed.
19 3. The PA shall amend the draft as necessary into a final CB for review
20 B. Once the final CB has been approved the PA shall “Submit” the CB through the Project Management Web Site to
21 the GC.
22

23 **3.2. EXECUTING THE CONSTRUCTION BULLETIN**

- 24 A. The GC shall acknowledge receipt of the CB on the Project Management Web Site as instructed in the Tutorial
25 Manual provided to the awarded contractor.
26 B. The GC shall notify all Sub-contractors of the CB and publish the CB to all field sets of drawings and specifications
27 as appropriate.
28 C. The GC shall execute the directives of the CB or submit COR documentation as necessary during the execution
29 and implementation of the CB.
30 1. See Specification 01 26 57 Change Order Request (COR)
31
32
33
34

END OF SECTION

**SECTION 01 26 57
CHANGE ORDER REQUESTS (COR)**

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17 3.3. CHANGE ORDER REQUEST REVIEW, APPROVAL, AND PROCESSING 5
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19
20 **PART 1 – GENERAL**

21
22 **1.1. SUMMARY**

- 23 A. Except in cases of emergency no changes in the Work required by the Contract Documents may be made by
24 the General Contractor (GC) without having prior approval of the City Engineer or his representative.
25 B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in
26 the Work by written Change Order (CO). Such changes may include additions and/or deletions.
27 C. Where the City desires to make changes in the Work through use of written Change Order Request (COR), the
28 following procedures apply:
29 1. If requested by the City, the GC shall prepare and submit a detailed proposal, including all cost and time
30 adjustments to which the GC believes it will be entitled if the change proposed is incorporated into the
31 Contract. The City shall be under no legal obligation to issue a Change Order for such proposal.
32 2. The parties shall attempt in good faith to reach agreement on the adjustments needed to the Contract to
33 properly incorporate the proposed change(s) into the Work. In the event that the parties agree on such
34 adjustments, the City may issue a Change Order and incorporate such changes and agreed to
35 adjustments, if any.
36 3. In some instances, it may be necessary for the City to authorize Work or direct changes in Work for which
37 no final and binding agreement has been reached and for which unit prices are not applicable. In such
38 cases the following shall apply.
39 a. Upon written request by the City, the GC shall perform proposed Work
40 b. The cost of such change may be determined in accordance with this specification.
41 c. In the event agreement cannot be accomplished as contemplated herein, the City may authorize
42 the Work to be performed by City forces or to hire others to complete the Work. Such action on
43 the part of the City shall not be the basis of a claim by the GC for failure to allow it to perform the
44 changed Work.
45 D. Where changes in the Work are made by the City through use of a force account basis, the GC shall as soon as
46 practicable, and in no case later than ten (10) working days from the receipt of such order, unless another time
47 period has been agreed to by both parties, give the City written Notice, stating:
48 1. The date, circumstances and source of the extra work; and,
49 2. The cost of performing extra work described by such Order, if any; and,
50 3. Effect of the order on the required completion date of the Project, if any.
51 E. The giving of each Notice by the GC as prescribed by this specification, shall be a requirement to liability of the
52 City for payment of any additional costs incurred by the GC in implementing changes in the Work. Under this
53 specification, no order or statement of the City shall be treated as a Change Order, or shall entitle the GC to an
54 equitable adjustment of the terms of this Contract or damages for costs incurred by the GC on any activity for
55 which the Notice was not given.
56 F. In the event Work is required due to an emergency as described in this specification the GC must request an
57 equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the
58 commencement of such emergency.

- 1 G. All GC requests for equitable adjustment shall be submitted to the CPM per the specifications below. Such
- 2 requests shall set forth with specificity the amount of and reason(s) for the proposed adjustment and shall be
- 3 accompanied by supporting information and documents.
- 4 H. No adjustment of any kind shall be made to this Contract, if asserted by the GC for the first time, after the date
- 5 of final payment.
- 6 I. This specification shall be used by the GC when preparing documentation for any COR to ensure each has been
- 7 properly and completely filled out as required by the City of Madison.
- 8 J. All COR documentation will be processed through the through the Construction Administration-Change Order
- 9 Request Library on the Project Management Web Site (PMWS).

10
11 **1.2. RELATED SPECIFICATION SECTIONS**

- 12 A. Section 01 26 13 Request for Information (RFI)
- 13 B. Section 01 26 46 Construction Bulletins (CB)
- 14 C. Section 01 26 63 Change Order (CO)
- 15 D. Section 01 31 23 Project Management Web Site
- 16 E. Parts of this specification will reference articles within "The City of Madison Standard Specifications for Public
- 17 Works Construction".
 - 18 1. Use the following link to access the Standard Specifications web page:
 - 19 <http://www.cityofmadison.com/business/pw/specs.cfm>
 - 20 a. Click on the "Part" chapter identified in the specification text. For example if the specification
 - 21 says "Refer to City of Madison Standard Specification 210.2" click the link for Part II, the Part II
 - 22 PDF will open.
 - 23 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
 - 24 to the referenced text.

25
26 **1.3. DEFINITIONS AND STANDARDS**

- 27 A. LABOR: The amount of time and cost associated with the performance of human effort for a defined scope of
- 28 Work. Labor is further defined as follows:
 - 29 1. Labor rate is the total rate which includes the base rate, taxes, insurance and fringe benefits required by
 - 30 agreement or custom.
 - 31 2. Unit labor is the labor hours anticipated to install the corresponding unit of material.
 - 32 3. Labor cost is the labor hours multiplied by the hourly labor rates.
- 33 B. MATERIAL: Actual material cost is the amount paid, or to be paid, by the GC for materials, supplies and
- 34 equipment entering permanently into the Work, including cost of transportation and applicable taxes. The cost
- 35 shall not exceed the usual and customary cost for such items available in the geographical area of the project
- 36 C. LARGE TOOLS AND MAJOR EQUIPMENT: Large tools and major equipment are those with an initial cost greater
- 37 than \$1,000, whether from the GC or other sources.
 - 38 1. Tool and equipment use and time allowed is only for extra work associated with change orders.
 - 39 a. Rental Rate is the machine cost associated with operating a piece of equipment for a defined
 - 40 length of time (hour, day, week, or month) and shall not exceed the usual and customary amount
 - 41 for such items available in the geographical area of the project.
 - 42 b. Rental cost is the rental rate multiplied by the anticipated duration the equipment shall be
 - 43 required.
 - 44 2. The GC shall provide a breakdown of all rental rates to indicate what items and costs are associated with
 - 45 the rate. Examples of items to include in the breakdown would be fuel consumption, lubrication,
 - 46 maintenance and other similar expenses but not including profit and overhead.
 - 47 3. When large tools and equipment needed for Change Order work are not already at the job site, the
 - 48 actual cost to get the item there is also reimbursable.
- 49 D. BOND COST: The cost shall be calculated at 1% of the total proposed change order.
- 50 E. SUB-CONTRACTOR COSTS: Sub-contractor costs are for those labor, material, and equipment costs required by
- 51 subcontracted specialties to complete the Change Order work including allowable markups as outlined within
- 52 this specification.
- 53 F. OVERHEAD AND PROFIT Markup: The allowable markup percentage to a COR by the GC and Sub-contractors for
- 54 overhead and profit. All of the following are expenses associated with overhead and profit and shall not be
- 55 reimbursable as individual items on any COR:
 - 56 1. CHANGE ORDER PREPARATION: All costs associated with the preparing and processing of the change
 - 57 order.

- 1 2. DESIGN, ESTIMATING, AND SUPERVISION: All such efforts, unless specifically requested by Owner as
- 2 additional Work to be documented as a COR or portion thereof.
- 3 3. INSTALLATION LAYOUT: The layout required for the installation of material and equipment, and the
- 4 installation design, is the responsibility of the GC.
- 5 4. SMALL TOOLS AND SUPPLIES: The cost of small hand tools with an initial cost of \$1,000 or less, along
- 6 with consumable supplies and expendable items such as drill bits, saw blades, gasoline, lubricating or
- 7 cutting oil, and similar items.
- 8 5. GENERAL EXPENSE: The general expense, which is those items that are a specific job cost not associated
- 9 with direct labor and material such as job trailers, foreman truck, and similar items.
- 10 6. RECORD DRAWINGS: The preparation of record or as-built drawings.
- 11 7. OTHER COSTS: Any miscellaneous cost not directly assessable to the execution of the Change Order
- 12 including but not limited to the following:
- 13 a. All association dues, assessments, and similar items.
- 14 b. All education, training, and similar items.
- 15 c. All drafting and/or engineering, unless specifically requested by Owner as additional Work to be
- 16 documented as a Change Order proposal or portion thereof.
- 17 d. All other items including but not limited to review, coordination, estimating and expediting, field
- 18 and office supervision, administrative work, etc.
- 19 G. Contract Extension: The necessary amount of time to be added to the contract deadlines for the completion of a
- 20 change order.
- 21

22 **1.4. CONTRACT EXTENSION**

- 23 A. The GC shall not assume that every COR will require a Contract Extension. If the GC feels a contract extension is
- 24 warranted he/she shall provide sufficient scheduling information that shows how the COR being requested
- 25 impacts the critical path of the project.
- 26 B. The City of Madison strongly encourages the GC to explore alternative methods and practices prior to submitting
- 27 a COR with a request for contract extension.
- 28

29 **1.5. OVERHEAD AND PROFIT MARKUP**

- 30 A. Pursuant to the City of Madison Standard Specifications for Public Works Construction, Section 104.7, Extra
- 31 Work, the following maximum allowable markups shall be strictly enforced on all change orders associated with
- 32 the execution of this contract.
- 33 1. The total maximum overhead and profit shall not exceed fifteen percent (15%) of the total costs.
- 34 2. The total maximum overhead and profit shall be distributed as follows:
- 35 a. For work performed and materials provided solely by the General Contractor, fifteen percent
- 36 (15%) of the total costs.
- 37 b. For work performed and materials provided solely by Sub-contractors and supervised by the
- 38 General Contractor:
- 39 i. Supervision of the GC, five percent (5%) of the total Sub-contractor cost.
- 40 ii. Sub-contractors work and materials ten percent (10%) of the total Sub-contractor cost.
- 41

42 **1.6. PERFORMANCE REQUIREMENTS**

- 43 A. The GC shall become thoroughly familiar with this specification as it will identify procedures and expenses that
- 44 are or are not allowed under the Change Order and Change Order Request process.
- 45 B. The GC shall be responsible for all of the following:
- 46 1. Carefully reviewing the CB that is associated with the COR.
- 47 2. Collecting required supporting documentation from all contractors that quantify the need for a COR.
- 48 a. Labor hours and wage rates
- 49 b. Material costs
- 50 c. Equipment costs
- 51 C. The following shall apply to establishing prices for labor, materials, and equipment costs:
- 52 1. Where Work to be completed has previously been established by individual bid items in the contract bid
- 53 proposal the GC shall use the unit bid prices previously established.
- 54 2. Where Work to be completed was bid as a Lump Sum without individual bid items the GC shall provide a
- 55 breakdown of all labor, materials, equipment including unit rates and quantities required.
- 56 D. The completion date is determined by Owner. The schedule, however, is the responsibility of the GC. Time
- 57 extensions for extra Work will be considered when a schedule analysis of the critical path shows that the Change
- 58 Order Request places the Work beyond the completion date stated in the Contract.

1
2 **1.7. QUALITY ASSURANCE**

- 3 A. The GC shall be responsible for ensuring that all COR supporting documentation meets the following
4 requirements prior to completing the COR form on the Project Management Web Site:
5 1. Sufficiently indicates labor, material, and other expenses related to completing the intent of the CB.
6 2. No costs exceed the usual and customary amount for such items available in the geographical area of the
7 project, and no costs exceed those established under the contract.
8 B. The Project Architect (PA), City Project Manager (CPM), other members of the consulting staff, and city staff shall
9 review all COR requests to ensure that the intent of the CB will be met under the proposal of the COR or request
10 additional information as necessary.
11

12 **PART 2 – PRODUCTS**

13
14 **2.1. CHANGE ORDER REQUEST FORM**

- 15 A. The COR form is located on the Project Management Web Site. The GC shall click the link in the left margin of
16 the project web site opening a new form. Follow additional instructions below in the execution section for filling
17 out the form.
18

19 **PART 3 - EXECUTION**

20
21 **3.1. ESTABLISHING A CHANGE ORDER REQUEST**

- 22 A. Upon receipt of a Construction Bulletin (CB) where the GC believes a significant change in contract scope
23 warrants the submittal of a COR the GC shall do all of the following within ten (10) working days after receipt of
24 the CB:
25 1. Review the CB with all necessary trades and sub-contractors required by the change in scope.
26 a. Additions or deletions to the contract scope shall be as directed within the CB.
27 b. Additions or deletions of labor and materials shall be determined by the GC based on the
28 directives of the CB.
29 2. Assemble all required back-up documentation for additions and deletions of materials, labor and other
30 related contract costs as previously outlined in this specification.
31 3. Submit a COR request form on the Project Management Web Site.
32 B. Submitting a COR does not obligate the GC to complete the work associated with the COR nor does it obligate
33 the Owner to approve the COR as a change to the contract.
34

35 **3.2. SUBMIT A CHANGE ORDER REQUEST FORM**

- 36 A. This specification shall provide a subject overview only. In depth instructions shall be provided to the awarded
37 Contractor in a PDF Instructional Manual.
38 B. The GC shall select the "Submit a COR" link on the Project Management Web Site.
39 C. The software will open a new COR form and the GC shall provide all of the following information:
40 1. DO NOT perform any calculations on this worksheet, only provide the raw data as requested below. All
41 calculations, totals, and markups shall be computed as described within this specification.
42 2. Provide a summary description of the COR request, and justification for any requested time extension to
43 the contract, indicate the number of calendar days being requested for the extension and add any
44 attachments to the form as needed.
45 3. Provide all GC self performance data including all of the following:
46 a. Materials description, quantities, and unit costs.
47 b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
48 c. Equipment descriptions, quantities, unit costs and rates.
49 4. Provide all Sub-contractor data including all of the following:
50 a. Materials description, quantities, and unit costs.
51 b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
52 c. Equipment descriptions, quantities, unit costs and rates.
53 5. Ensure all calculations performed by the form have been completed correctly. Contact the CPM directly
54 if you suspect an error before hitting the save button.
55 C. At any time after creating a COR you must at a minimum click "Save as Draft" to save your work.
56 D. When all data has been entered and verified click on the "Submit COR" button. This will kick off the COR Review
57 and Approval process.
58

1 **3.3. CHANGE ORDER REQUEST REVIEW, APPROVAL, AND PROCESSING**

- 2 A. The PA and CPM shall review all CORs submitted by the GC.
3 1. Additional consulting staff and city staff having knowledge of the components of the COR shall review
4 and advise the PA and CPM as to the accuracy of the items, quantities, and associated costs of the COR as
5 directed by the CB.
6 2. The CPM shall review the COR with the Owner.
7 B. If required the PA and CPM, shall in good faith, further negotiate the COR with the GC as necessary. All
8 amendments to any COR shall be documented within the Project Management Web Site software.
9 C. After final review of the COR the CPM and Owner may accept the COR.
10 D. The CPM shall prepare the COR in the form of an official Board of Public Works Change Order for final review and
11 approval as outlined in Section 01 26 63 Change Order (CO).
12 E. The GC shall not act upon any accepted COR until it has received final approval through the Public Works process
13 as an official CO to the Work unless instructed to do so by the CPM. Proceeding without the final approval of a
14 fully authorized Change Order is at the GC's own risk.
15

16 **3.4. EMERGENCY CHANGE ORDER REQUEST**

- 17 A. In the event Work is required due to an emergency as described in the Contract Documents, the GC must
18 request an equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the
19 commencement of such emergency.
20 B. The GC shall provide full documentation of all labor, materials and equipment used during the period of
21 emergency as part of the COR submittal.
22
23
24
25

END OF SECTION

**SECTION 01 26 63
CHANGE ORDER (CO)**

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7 1.3. BOARD OF PUBLIC WORKS PROCEDURE 1
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9 2.1. CHANGE ORDER FORM..... 2
10 PART 3 - EXECUTION 2
11 3.1. PREPARATION OF THE CHANGE ORDER 2
12 3.2. EXECUTION OF THE CHANGE ORDER 2
13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made
18 by the General Contractor (GC) without having prior approval of the City Project Manager (CPM).
19 B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in
20 the Work by written Change Order. Such changes may include additions and/or deletions.
21 C. The Change Order (CO) is a Board of Public Works (BPW) form that is reviewed and approved by a specific
22 process.
23 D. The CO form is typically made up of multiple Change Order Requests (CORs) and/or Bid Items as appropriate
24 depending on the type of project and how the contract was bid.
25 E. All CO documentation shall be processed through the Construction Administration-Change Order Library and
26 digital workflow on the Project Management Web Site (PMWS).
27

1.2. RELATED SPECIFICATION SECTIONS

- 28
29 A. Section 01 26 13 Request for Information (RFI)
30 B. Section 01 26 46 Construction Bulletin (CB)
31 C. Section 01 26 63 Change Order Request (COR)
32 D. Section 01 31 23 Project Management Web Site
33

1.3. BOARD OF PUBLIC WORKS PROCEDURE

- 34
35 A. The Board of Public Works has a very explicit procedure for the review and approval of all change orders
36 associated with any Public Works Contract as follows:
37 1. The Supervisory Chain of the CPM shall review and approve any CO under \$10,000 provided it does not
38 include either of the following:
39 a. The CO does not request a time extension to the contract.
40 b. The CO does not cause the contract contingency sum to be exceeded.
41 2. The Board of Public Works shall review and approve any CO that requires any of the following:
42 a. Any CO over \$10,000.
43 b. Any CO requesting a time extension to the contract regardless of the monetary value of the CO.
44 c. Any CO that that causes the contract contingency sum to be exceeded.
45 B. The Board of Public Works generally meets every other week and only once in August and December. The GC is
46 cautioned that, under normal scheduling, a CO requiring a BPW review will take a minimum of two (2) weeks to
47 achieve final approval.
48 1. The City shall not be responsible for additional delays to the Work caused by the scheduling constraints
49 of the Board of Public Works.
50 C. **SPECIAL NOTE:** The GC is cautioned to never proceed unless told to do so by the CPM. Only in rare instances
51 may the CPM give a written notice to proceed on a COR without an approved CO. Proceeding without the
52 written notice of the CPM or an approved CO is at the GC's own risk.
53

1 **PART 2 – PRODUCTS**
2

3 **2.1. CHANGE ORDER FORM**

- 4 A. The CO form is located on the Project Management Web Site. The CPM shall click the link in the left margin of
5 the project web site opening a new form. Project information is pre-loaded, the CPM only needs to enter
6 information and make attachments as needed to complete the form.
7

8 **PART 3 - EXECUTION**
9

10 **3.1. PREPARATION OF THE CHANGE ORDER**

- 11 A. The CPM shall prepare the required CO forms in the Construction Administration-Change Order Library on the
12 Project Management Web Site as follows:
13 1. Provide information for all contract information.
14 2. Provide a general description of the items described within the change order.
15 3. Provide detailed information for each Item on the CO form. At the option of the CPM he/she may include
16 multiple Change Order Requests each as their own item.
17 4. Provide required pricing and accounting information as needed for the item.
18 5. Insert attachments of contractor/architect provided information that clarifies and quantifies the CO.
19 Attachments may include but not be limited to material lists, estimated labor, revised details or
20 specifications, and other documents that may be related to the requested change.
21 6. Save the final version of the completed CO.
22

23 **3.2. EXECUTION OF THE CHANGE ORDER**

- 24 A. Upon saving the CO as described in section 3.1 above the software associated with the Project Management
25 Web Site shall notify the GC that the CO has been drafted and is ready for review. The GC shall do the following:
26 1. Open the appropriate CO form in the Construction Administration-Change Order Library and review all
27 items on the form.
28 2. The GC shall notify the CPM immediately of any errors or discrepancies on the form and shall not sign or
29 save it.
30 a. The CPM shall make any corrections as needed, re-save the form, and notify the GC.
31 3. If/when the GC concurs with the CO form as drafted the GC shall digitally sign the form and click SAVE.
32 B. After the GC digitally signs/saves the CO it shall be routed through the Project Management Web Site for
33 additional review and/or approvals. The CPM shall do the following:
34 1. Monitor the review process to ensure the software is working properly at each review step.
35 2. Ensure that proper BPW procedures are executed as needed by the CO approval process.
36 a. Schedule the CO on the next available BPW agenda if required.
37 i. Attend the BPW meeting to speak on the CO to board members and answer questions.
38 ii. The GC and/or PA may be required to attend the BPW meeting to address specific
39 information as it relates to the Work and/or materials associated with the CO.
40 3. Monitor final approval and distribution of the CO.
41 4. Notify the GC that the CO has been completed.
42 5. Ensure that the CO is posted to the next Public Works payment schedule.
43 6. Verify that the GC's next Progress Payment-Schedule of Values show the CO as part of the contract sum.
44 C. Upon final approval of the CO the GC may proceed with executing the Work associated with the CO.
45
46
47
48

END OF SECTION

**SECTION 01 29 73
SCHEDULE OF VALUES**

1
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4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 1.3. RELATED DOCUMENTS 1
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11 3.1. AIA DOCUMENT G702 – APPLICATION AND CERTIFICATE FOR PAYMENT 2
12 3.2. AIA DOCUMENT G703 – CONTINUATION SHEET 2
13 3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL 3
14 3.4. SOV FOR PROGRESS PAYMENT REQUESTS 3
15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The Schedule of Values (SOV) is a Contractor provided statement that allocates portions of the total contract
20 sum to various portions of the contracted work and shall be the basis for reviewing the Contractors Progress
21 Payment Requests.
22 B. AIA Document G702 – Application and Certificate for Payment and AIA Document G703 Continuation Sheet shall
23 be filled out in sufficient detail to be used as a guideline in determining work completed and materials stored on
24 site when verifying Progress Payment Requests.
25 C. The General Contractor shall be responsible for filling out, updating, and providing these work sheets with each
26 Progress Payment Request.
27

1.2. RELATED SPECIFICATIONS

- 29 A. Section 01 26 63 Change Order (CO)
30 B. Section 01 29 76 Progress Payment Procedures
31 C. Section 01 31 23 Project Management Web Site
32 D. Section 01 32 26 Construction Progress Reporting
33 E. Section 01 33 23 Submittals
34 F. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
35 Works Construction”.
36 1. Use the following link to access the Standard Specifications web page:
37 <http://www.cityofmadison.com/business/pw/specs.cfm>
38 a. Click on the “Part” chapter identified in the specification text. For example if the specification
39 says “Refer to City of Madison Standard Specification 210.2” click the link for Part II, the Part II
40 PDF will open.
41 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
42 to the referenced text.
43

1.3. RELATED DOCUMENTS

- 45 A. The following documents shall be used as the basis for initiating and maintaining the SOV worksheets throughout
46 the execution of this contract.
47 1. Drawing documents and specifications (including general provisions) as provided with the bid set
48 documents and any published addendums.
49 2. Documents associated with revisions or clarifications to number 1 above after awarding of the contract,
50 including but not limited to:
51 a. Construction Bulletins
52 b. Request for Information
53 c. Approved Change Orders
54 3. The latest daily/weekly Construction Progress Report
55 4. Other specifications as identified in Section 1.2 above

1
2 **1.4. BASIS OF VALUES**

- 3 A. The Contractor shall provide a breakdown of the Contract Sum in sufficient detail to assist the Architect and City
4 Project Manager in evaluating Progress Payment Requests.
5 B. The total sum of all items shall equal the Contract Sum.
6

7 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

8
9 **PART 3 - EXECUTION**

10
11 **3.1. AIA DOCUMENT G702 – APPLICATION AND CERTIFICATE FOR PAYMENT**

- 12 A. The Contractor shall use AIA Document G-702 Application and Certificate for Payment with each Progress
13 Payment Request.
14 B. Completely fill out the Project Information section as follows:
15 1. TO OWNER; provide all owner related information as provided in the contract documents.
16 2. PROJECT; provide all contract information including contract number, title and address.
17 3. FROM CONTRACTOR; provide all contractor related information.
18 4. VIA ARCHITECT; provide all the architect's related information including the architect's project reference
19 number if different from the owners.
20 5. Indicate the current APPLICATION NO., PERIOD TO date, and CONTRACT DATE.
21 C. Completely fill out the Contractors Application for Payment section.
22 1. Fill out lines 1 through 9 to reflect the current status of the contract through the payment date being
23 requested.
24 2. The City of Madison calculates retainage on Public Works Contracts as follows:
25 a. In general, across the duration of the contract, 2.5% of the total contract sum, including change
26 orders, is withheld for retainage as referenced from the City of Madison Standard Specification
27 110.2:
28 i. Beginning with Progress Payment 1, 5% retainage will be withheld until such time that 50%
29 of the total contract sum has been paid out.
30 ii. No additional retainage will be withheld after 50% of the total contract sum has been paid,
31 unless additional change orders have been approved after the 50% milestone has been
32 reached. Per City of Madison Standard Specification 110.2, additional retainage up to 10%,
33 may be held in the event there are holds placed by Affirmative Action or liquidated
34 damages by BPW.
35 iii. Retainage for additional change orders after the 50% milestone will be withheld at the rate
36 of 2.5% of the total cost of the change order.
37 iv. Retainage is based on the change orders posted to the City's contract worksheet at the
38 time the progress payment is processed.
39 D. Completely fill out the Change Order Summary section. Only change orders that have been finalized and posted
40 to the City of Madison's Application for Partial Payment worksheet may be itemized into the SOV documents.
41 E. The Contractor shall sign and date the application and it shall be properly notarized.
42 F. The Contractor shall not fill in any information in the Architects Certificate for Payment section.
43

44 **3.2. AIA DOCUMENT G703 – CONTINUATION SHEET**

- 45 A. The Contractor shall use AIA Document G-703 Continuation Sheet to itemize his/her SOV for this contract.
46 Provide additional sheets as necessary.
47 B. Provide information in Column A (Item No.), Column B (Description of Work), and Column C (Scheduled Value) by
48 any method that allocates portions of the total contract sum to various portions of the contracted work.
49 Possible methods include combinations of the following:
50 1. By division of work
51 2. By contractor, sub-contractor, sub sub-contractor
52 3. By specialty item or group
53 4. Other methods of breakdown as may be requested by the City Project Manager or City Construction
54 Manager at the pre-construction meeting.
55 C. Provide total cost of the item/description of work including proportionate shares of profit and overhead related
56 to the item.
57

1 **3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL**

- 2 A. The Contractor shall upload his/her initial SOV to the Project Management Web Site, Submittals Library, no later
3 than five (5) working days after the Pre-construction Meeting.
4 1. The initial SOV shall provide information in Column A (Item No.), Column B (Description of Work), and
5 Column C (Scheduled Value) only.
6 2. The level of detail shall be as described in section 3.2 above.
7 B. The Project Architect (PA) and the City Project Manager (CPM) shall review the SOV as any other submittal and
8 may require modifications to reflect additional detail as necessary.
9 C. The Contractor shall resubmit the SOV as necessary until such time as the PPA and CPM have sufficient detail for
10 assessing and approving future Progress Payment Applications.
11 D. Progress Payment Application 1 will not be processed until such time as the Contractor has met this requirement
12 regardless of the amount of work completed per the application.
13

14 **3.4. SOV FOR PROGRESS PAYMENT REQUESTS**

- 15 A. The Contractor shall update the initial SOV with each Progress Payment Application as follows:
16 1. Initial items and values as part of Section 3.3 above will not be adjusted once the original Schedule of
17 Values submittal has been approved.
18 2. Change orders shall be added as additional items and values at the bottom of the SOV as they become
19 approved and posted to the City's contract worksheet. The value for each change order shall be the
20 value indicated on the SOV and shall stand alone. Values shall not be split out or combined with other
21 existing items with similar work descriptions on the original SOV.
22 3. Fill out Columns D, E, F and G to properly reflect the work completed and materials received since the last
23 Progress Payment Application.
24 4. Only materials delivered and stored on the project site may be reflected on SOV progress updates.
25 B. Provide updated G702 and G703 sheets with each Progress Payment application.
26 C. See Specification 01 29 76 Progress Payment Procedures for additional information on submitting Progress
27 Payment Applications.
28

29 **3.5. G703 BREAKDOWN FOR CITY CHANNEL REMODEL**

- 30 A. The various areas of work indicated on the plan sheets for this contract are funded by different agencies. Those
31 areas are indicated on the plans as:
32 1. City Channel space
33 2. City SRP space
34 3. County SRP space
35 B. The Contractor shall provide an SOV for this project that indicates materials and work associated with each of
36 those spaces as follows:
37 1. Column B (Description of Work)
38 a. Shall be prefixed as follows for each of the 3 spaces indicated above
39 i. Prefix "CC" for City Channel
40 ii. Prefix "CiS" for City SRP
41 iii. Prefix "CoS" for County SRP
42 b. Additional description of the type of work associated with the space
43 c. EXAMPLES:
44 i. CC-Framing
45 ii. CiS-Framing
46 iii. CoS-Framing
47 2. Column C (Scheduled Value) shall indicate the approximate cost for the described work and materials
48 installed for only that space.
49 C. The Contractor shall use the following methods when identifying costs associated to each area:
50 1. For items that can be easily quantified and assessed to a specific space provide the description and cost
51 associated with that description. Examples of easily quantified and assessed items would include the
52 following:
53 a. Items that can be quantified by a fixed count (doors, lights, locks, switches, diffusers, etc)
54 b. Items that can be quantified by a measured quantity (flooring, paint, wall construction, etc)
55 2. For items that support more than one space provide the prefix and description and divide the overall cost
56 by 2 or 3 as it is relevant to the spaces the item is supporting.
57 a. Examples of this method would include the installation of a main HVAC supply or return trunk,
58 main sprinkler runs, electrical distribution wiring to breaker panels supporting multiple areas, etc.

- 1 D. The Contractor shall post approved Change Orders as new items to the SOV. The item description shall include
- 2 the same prefix as described above and the cost method shall be associated with each space as noted above.
- 3 E. The Contractor shall provide a final SOV prior to project closeout. The final SOV shall be sorted by space prefix
- 4 (CC, CiS, CoS) and each space shall have its own final sub-total.
- 5
- 6
- 7
- 8
- 9

END OF SECTION

SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

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3
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7 1.3. RELATED DOCUMENTS 1
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10 PART 2 - PRODUCTS - THIS SECTION NOT USED 4
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13 3.2. PROJECT ARCHITECT PROCEDURE 5
14 3.3. CITY PROJECT MANAGER PROCEDURE 5
15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The General Contractor (GC) shall review this and all related specifications prior to submitting progress payment
20 requests.
21 B. Progress payment requests (Partial Payment-PP) for this contract shall be uploaded digitally by the GC to the
22 Project Management Web Site
23 C. The Project Architect (PA) and City Project Manager (CPM) shall review and amend or approve the PP on the
24 Project Management Web Site.
25 D. After approval of the PP by the CPM, he/she shall forward the PP to the appropriate agencies for BPW
26 contractual review and payment processing.
27

1.2. RELATED SPECIFICATIONS

- 29 A. Section 01 26 63 Change Order (CO)
30 B. Section 01 29 73 Schedule of Values
31 C. Section 01 31 19 Progress Meetings
32 D. Section 01 31 23 Project Management Web Site
33 E. Section 01 32 16 Construction Progress Schedules
34 F. Section 01 32 26 Construction Progress Reporting
35 G. Section 01 33 23 Submittals
36 H. Section 01 45 16 Field Quality Control Procedures
37 I. Section 01 77 00 Closeout Procedures
38 J. Section 01 78 13 Completion and Correction List
39 K. Section 01 78 23 Operation and Maintenance Data
40 L. Section 01 78 36 Warranties
41 M. Section 01 78 39 As-Built Drawings
42 N. Section 01 78 43 Spare Parts and Extra Materials
43 O. Section 01 79 00 Demonstration and Training
44

1.3. RELATED DOCUMENTS

- 46 A. The following documents shall be used when evaluating PP requests.
47 1. Daily and weekly construction progress reports filed since the last payment request.
48 2. Contractors Schedule of Values as updated from the last payment request. See Specification 01 29 73.
49 3. Any document that may be required to be submitted for review and approval, as noted by the
50 specifications listed in Section 1.2 above, or the Progress Payment Milestone Schedule in Section 1.4
51 below, to achieve a required bench mark of contract progression or contract requirement.
52

1.4. PROGRESS PAYMENT MILESTONES

- 54 A. City Engineering-Facility Management has developed the Project Payment Milestone Schedule (Section 1.4
55 below) to assist the GC in providing required construction specific documentation and general contractual
56 documentation in a timely manner.
57 B. The Progress Payment Milestone Schedule is not an all inclusive list. Multiple agencies review progress payment
58 requests and contract closeout requests. Missing, incomplete, or incorrect documentation for any agency may

- 1 be a cause for not processing progress payments. It shall be the sole responsibility of the Contractor for
 2 providing documentation as required or requested to the appropriate agencies.
 3 C. The milestone schedule is based on the contract total sum and shall be valid for most contracts. Milestone
 4 submittals will be required with whatever progress payment hits the percentage of contract total indicated in
 5 the schedule.
 6 D. The CPM shall review the milestone schedule with each progress payment request and at his/her option may
 7 elect to hold processing the progress payment until such time as the contractor has met the requirements for
 8 providing construction specific documentation.
 9 E. It shall be the General Contractors responsibility to comply with all BPW Contract Administration requirements
 10 and related deadlines as outlined in the Award Letter, Award Checklist, and Start Work Letter.
 11

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
BPW Contract Administration Documentation <ul style="list-style-type: none"> • Workforce profiles • Best Value Contracting Documentation • Sub-contractors prequalification approval & Affirmative Action plans • Other as may be required 	PP-1, or start work as applicable	<ul style="list-style-type: none"> • For GC and Sub-contractors before PP-1 regardless of scheduling • Sub-contractors (if applicable), due 10 days before they may start work • Sub-contractors (if applicable), due 10 days before they may start work
Required Construction Submittals <ul style="list-style-type: none"> • Contractors Project Directory • Schedule of Values • Submittals Schedule • Waste Management Plan • Closeout Requirement Checklist • Warranty Checklist 	PP-1	References <ul style="list-style-type: none"> • Specification 01 31 23 • Specification 01 29 73 • Specification 01 32 19 • Specification 01 74 19 • Specification 01 77 00 • Specification 01 78 36
Construction Progress Milestones <ul style="list-style-type: none"> • Early submittals, per submittal schedule • Detailed Contract Schedules 	PP-1	See specifications for specific requirements <ul style="list-style-type: none"> • Specification 01 32 19, Examples: concrete mix, structural steel, products with long lead times • See Specification 01 32 16
General Construction Progress Requirements are all up to date <ul style="list-style-type: none"> • Progress Schedules • Submittals/Re-submittals (ongoing) • Schedule of Values • Progress Reporting • LEED Documentation • Waste Management documentation • QMOs are being addressed and closed • Progress Cleaning • As-Built Drawings 	Each future PP	Verified with each Progress Payment Request <ul style="list-style-type: none"> • Specification 01 32 16 • Specification 01 33 23 • Specification 01 29 73 • Specification 01 32 26 • All specifications with LEED documentation requirements • Specification 01 74 19 • Specification 01 45 16 • Specification 01 74 13 • Specification 01 78 39
* All of the above are being updated on the Project Management Web Site as required		
BPW Contract Administration Documentation <ul style="list-style-type: none"> • Weekly payroll reports • Best Value Contracting Reports • SBE Reports 	25% CT or PP 2	See 1.4.E above. <i>This progress payment will be withheld by BPW for any missing contractual documentation.</i>

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
Construction Progress Milestones <ul style="list-style-type: none"> Construction/Contract Closeout Meeting #1 Submittals/Re-submittals complete 	50% CT	<ul style="list-style-type: none"> Specification 01 31 19 Specification 01 33 23
Operation and Maintenance (O & M) drafts	60% CT	Specification 01 78 23
Construction/Contract Closeout Meeting #2 <ul style="list-style-type: none"> Construction closeout checklist 	70% CT	See specification 01 31 19 <ul style="list-style-type: none"> Specification 01 77 00
BPW Contract Administration Documentation <ul style="list-style-type: none"> Request Finalization Review from BPW 	80% CT	This is a recommendation to the GC and is not a requirement of this PP. <ul style="list-style-type: none"> Specification 01 77 00
Construction Progress Milestones <ul style="list-style-type: none"> Operation and Maintenance (O & M) finals, accepted All major QMO issues resolved As-Built Drawings, Division Trades ready for GC review 	80% CT	<ul style="list-style-type: none"> Specification 01 78 23 Specification 01 45 16; Items that could prevent occupancy Specification 01 78 39
All of the following shall be completed for this PP: <ul style="list-style-type: none"> Regulatory Inspections completed All QMO reports closed Demonstration and Training completed Attic Stock completed Final Cleaning 	90% CT	Contractor to determine the proper order of completion: <ul style="list-style-type: none"> Governing ordinances and statutes Specification 01 45 16 Specification 01 79 00 Specification 01 78 43 Specification 01 74 13
Construction Closeout Procedures: <ul style="list-style-type: none"> Letter of Substantial Compliance sent to BI and DHS as needed Certificate of Occupancy issued As-Built Drawings, finals, accepted City Letter of Substantial Completion Warranty letters dated and issued 	100% CT	See Specification 01 77 00 <ul style="list-style-type: none"> Generated/Signed by the Architect Building Inspection Specification 01 78 39 Signed by the City Engineer Specification 01 78 36
* Completion of this begins the one year warranty.		
BPW Contract Administration Documentation Contract Closeout Procedures <ul style="list-style-type: none"> Construction Closeout has been completed Contractor requests final payment of retainage All BPW contractual requirements are verified 	Final	See Specification 01 77 00 <ul style="list-style-type: none"> Contractor must provide any missing BPW Contractual Documentation
* Completion of this closes the contract but not the warranty period/bond.		
NOTE: CT = Contract Total less held retainage		

1 **1.5. PROGRESS PAYMENT SUBMITTAL**

- 2 A. Each progress payment submittal shall be:
- 3 1. Digital in PDF format
- 4 2. PDF shall be in color
- 5 3. Uploaded to the appropriate Project Management library and properly named per the tutorial
- 6 instructions provided to the awarded contractor.
- 7 B. Submit all required construction progress documentation to the appropriate Project Management Web Site
- 8 library.
- 9 C. In general the following shall apply to all PP requests:
- 10 1. Materials or products:
- 11 a. On order, being shipped, etc. may not be invoiced.
- 12 b. Received and stored on the project site may be invoiced.
- 13 c. Being manufactured off site at any location may not be invoiced (example: cabinetry, ductwork,
- 14 etc.)
- 15 d. Completed products stored off site locally waiting for delivery to the project site may be invoiced
- 16 with prior approval by the CPM. All of the following conditions must be met to be allowed:
- 17 i. Items must be visually inspected by CPM to verify product is complete.
- 18 ii. Item must be stored inside a compatible structure and the structure and contents must be
- 19 insured.
- 20 iii. Contractor is responsible for condition until installation is completed.
- 21 2. All labor and equipment, including rental time for the current progress period may be invoiced.
- 22 3. Only completed installations may be invoiced to 100% based on the Schedule of Values.
- 23 D. DO NOT submit BPW Contract Administration Documentation for review with Progress Payment Requests,
- 24 submit them directly to the correct agency and in the correct format as instructed from information in your BPW
- 25 Contract Award Packet instructions.
- 26

27 **PART 2 - PRODUCTS - THIS SECTION NOT USED**

28

29 **PART 3 - EXECUTION**

30

31 **3.1. GENERAL CONTRACTOR PROCEDURE**

- 32 A. The GC shall provide an updated version of his/her schedule of values (AIA documents G702 & G 703) with each
- 33 PP request.
- 34 1. The AIA - Application and Certificate for Payment (G702) shall be properly filled out and prepared for the
- 35 Architects review. See specification 01 29 73, Schedule of Values for more information.
- 36 2. The AIA - Continuation sheets (G703) shall be properly filled out and indicate the dollar value of the
- 37 completed work to date for each item on the form. See specification 01 29 73, Schedule of Values for
- 38 more information.
- 39 a. The GC shall subtotal the work completed to date for all of the original Schedule of Value items.
- 40 b. Divide the sub total of work completed by the Original Contract Total to obtain a percentage
- 41 complete of the original Lump Sum Bid. This percentage may be taken out to five (5) decimal
- 42 places (round fifth place up or down as needed).
- 43 i. Example: \$5,192.55 of completed work divided by \$10,000 original Contract Total =
- 44 0.519255, round this to 0.51926
- 45 c. Write the percentage in Column 10 on the City Tabular Sheet for the original lump sum bid item in
- 46 RED ink.
- 47 3. Ensure that any newly posted change orders from the City of Madison provided tabulation sheet have
- 48 been entered on the G703 continuation sheets. Repeat steps a thru c above for each change order on
- 49 the schedule of values and the City Tabular Sheet.
- 50 B. The GC shall fill out the City of Madison Application and Certificate of Payment cover sheet as follows:
- 51 1. The GC shall not change any pre-printed information and shall not write in the box that indicates previous
- 52 progress payments.
- 53 2. The GC shall sign and date the form where indicated.
- 54 3. The GC shall provide the dates from and to for the PP being requested.
- 55 4. The GC shall provide the list of all contractors/sub-contractors that were actively working during the
- 56 dates indicated above.

- 1 a. All contractors/sub-contractors named must be in compliance with all City requirements (Pre-qualified, Affirmative Action Plan on file, etc). The PP will be held and not processed by the City of
2 Madison until all contractors/sub-contractors are in compliance.
3
4 b. Do not list the names of suppliers or manufacturers, doing so will slow down processing and
5 require a re-submittal of the paperwork.
- 6 C. The General Contractor (GC) shall scan all of the documents listed below in the order shown, save the scan as a
7 single PDF file for each PP request.
8 1. City cover sheet – Application and Certificate for Payment
9 2. City tabulation sheet(s)
10 3. AIA G702 - Application and Certificate for Payment
11 4. AIA G703 - Continuation Sheet(s)
12 5. Any miscellaneous documents that may be requested as backup documentation for the pay request.
13 a. Lien waivers are not required and shall not be submitted.
14 b. Do not provide contractual administrative documents such as pay reports with pay requests.
15 c. Do not supply progress deliverables with pay requests.
- 16 F. Upload the pay request PDF to the Contract Documents-GC Partial Pay Apps library on the Project Management
17 Web Site.
18

19 **3.2. PROJECT ARCHITECT PROCEDURE**

- 20 A. The PA shall review the AIA-continuation sheets provided by the GC to determine if the Schedule of Values
21 accurately reflects the work completed for the inclusive dates indicated.
22 B. The PA shall advise the CPM of any discrepancies in the schedule of values.
23 C. The PA shall work with the GC and the CPM to resolve any issues prior to signing the AIA - Application and
24 Certificate for Payment.
25 D. When verified, the PA shall digitally sign the original PDF version of the AIA - Application and Certificate for
26 Payment on the Project Management Web Site.
27

28 **3.3. CITY PROJECT MANAGER PROCEDURE**

- 29 A. The CPM shall review all documents submitted by the GC and work with the PA to ensure the schedule of values
30 accurately reflects the work completed to date.
31 B. The CPM may elect to hold processing of any progress payment pending submittal of required progress payment
32 milestones.
33 C. When verified, the CPM shall digitally sign the City Cover Sheet and forward the required documentation to the
34 appropriate City agencies for further processing of the payment request.
35 D. The CPM shall add a scanned copy of any documents indicating the PP request processing was completed to the
36 PMWS.
37
38
39

END OF SECTION

**SECTION 01 31 13
PROJECT COORDINATION**

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8 1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS 2
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10 PART 2 – PRODUCTS – THIS SECTION NOT USED 3
11 PART 3 – EXECUTION – THIS SECTION NOT USED 3
12

PART 1 – GENERAL

1.1. SUMMARY

- 16 A. Project Coordination covers many areas within the execution of the Contract Documents and the requirements
17 of proper coordination are the applicable to all contractors executing the Work of this contract.
18 B. This specification provides general information regarding project coordination for the General Contractor and all
19 Sub-contractors. All contractors shall be familiar with project coordination requirements and responsibilities
20 that may be defined in other specification within these Contract Documents.
21 C. The General Contractor shall at all times be responsible for the project, project site, and execution of the
22 Contract Documents.
23

1.2. RELATED SPECIFICATIONS

- 24 A. Section 01 29 76 Progress Payment Procedures
25 B. Section 01 31 19 Progress Meetings
26 C. Section 01 31 23 Project Management Web Site
27 D. Section 01 32 16 Construction Progress Schedules
28 E. Section 01 32 19 Submittals Schedule
29 F. Section 01 33 23 Submittals
30 G. Section 01 43 39 Mockups
31 H. Section 01 45 16 Field Quality Control Procedures
32 I. Section 01 60 00 Product Requirements
33 J. Section 01 77 00 Closeout Procedures, including all specifications referenced therein
34
35

1.3. GENERAL REQUIREMENTS

- 36 A. The following general requirements shall applicable to all contractors:
37 1. Cooperate with the Owner, all authorized Owner Representatives, Project Architect and all consultants of
38 the Owner.
39 2. Materials, products, and equipment shall be new, as specified and to industry standards except where
40 otherwise noted.
41 3. Labor and workmanship shall be of a high quality and to industry standards.
42 B. Existing conditions:
43 1. Verify all existing conditions noted in the contract documents with actual filed locations. Verify
44 dimensions, sizes and locations, of structural, equipment, mechanical and utility components.
45 2. Report any inconsistencies, errors, omissions, or code violations in writing to the General Contractor (GC)
46 immediately.
47 3. Annotate any inconsistencies, errors, omissions on the GC As-Built record drawings immediately for
48 future reference.
49 C. Contract Documents:
50 1. The Contract Documents are intended to include everything necessary to perform the work. Every item
51 required may not be specifically mentioned, shown, or detailed.
52 a. Except where specifically stated all systems and equipment shall be complete, installed, and fully
53 operable.
54 b. If a conflict exists within the contract documents the contractor shall furnish the item, system, or
55 workmanship of the highest quality, largest, largest quantity, or most closely fits the intent of the
56 contract documents.
57

**SECTION 01 31 19
PROJECT MEETINGS**

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12 3.2. PROJECT MANAGEMENT WEB SITE – TUTORIAL MEETING 2
13 3.3. CONSTRUCTION PROGRESS MEETINGS 2
14 3.4. PRE-INSTALLATION MEETINGS 2
15 3.6 PRE-CONTRACT CLOSEOUT MEETINGS 3
16 3.7 OTHER SPECIAL MEETINGS 3
17

PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The purpose of this specification is to identify various project related meetings and the responsible parties for
22 scheduling, agendas, minutes, and required attendance.
23 B. This specification is not intended to be inclusive of all meeting types or a complete list of required meetings.
24 C. This specification is not intended to cover planning and execution meetings between the General Contractor
25 (GC) and his/her sub-contractors.

1.2. RELATED SPECIFICATIONS

- 28 A. 01 31 23 Project Management Web Site
29 B. 01 32 16 Construction Progress Schedules
30 C. 01 43 39 Mockups

1.3. PROJECT MEETING TYPES

- 33 A. The following project meeting types may be used but not limited to the following
34 1. Preconstruction Meeting
35 2. Project Management Web Site – Tutorial Meeting
36 3. Construction Progress Meetings
37 4. Pre-installation Meetings (including mock-up review meetings)
38 5. Weekly Trade Meetings
39 6. Special Meetings

1.4. GENERAL REQUIREMENTS

- 42 A. Representatives of Contractors, Subcontractors, and suppliers attending meetings shall be qualified and
43 authorized to act on behalf of the entity each represents.
44

PART 2 – PRODUCTS – NOT USED IN THIS SECTION

PART 3 - EXECUTION

3.1. PRECONSTRUCTION MEETING

- 50 A. After execution of the Contract the City Project Manager (CPM) shall schedule and conduct the Preconstruction
51 Meeting at the Owner’s facilities. The CPM shall coordinate the meeting agenda with the Project Architect and
52 the GC Project Manager.
53 B. The CPM shall be responsible for the final agenda.
54 C. The CPM and Project Architect shall take notes on the meeting and post completed meeting minutes.
55 D. Attendance shall be required by all of the following:
56 1. Owner Representative(s)
57 2. Architect and applicable sub consultant(s)
58 3. General Contractor and applicable subcontractors and suppliers

- 1
- 2
- 3 E. Topics of the Preconstruction Meeting shall include but not be limited to the following:
- 4 1. Staff and contractor introductions
- 5 2. Completion Date
- 6 3. BPW Administrative requirements and due outs
- 7 a. Small Business Enterprise (SBE) (if applicable)
- 8 b. Certified payroll forms
- 9 c. Workforce profiles
- 10 d. Best Value Contracting (BVC)
- 11 4. General Facility Management Division 1 Specifications, including:
- 12 a. Section 01 29 76 Progress Payment Procedures
- 13 b. Section 01 31 23 Project Management Web Site (overview)
- 14 c. Section 01 45 16 Field Quality Control Procedures
- 15 d. Section 01 77 00 Closeout Procedures
- 16 5. Project Meeting scheduling
- 17 a. Section 01 31 19 Project Meetings
- 18 6. Construction Schedule
- 19

20 **3.2. PROJECT MANAGEMENT WEB SITE – TUTORIAL MEETING**

- 21 A. The CPM shall schedule and conduct a tutorial presentation of the PMWS prior to the beginning of construction.
- 22 B. The CPM shall be responsible for the final agenda, there will be no minutes.
- 23 C. The required attendance list in 3.1.D. above shall apply except for City Staff in items 1 and 4 who are already
- 24 familiar with the PMWS system.
- 25 D. It is recommended that all contractors bring their lap top, tablet or other internet capable device with them
- 26 including a fully charged battery and internet connection devices as necessary.
- 27

28 **3.3. CONSTRUCTION PROGRESS MEETINGS**

- 29 A. In general all of the following shall apply:
- 30 1. Representatives of Contractors, Subcontractors, and suppliers attending meetings shall be qualified and
- 31 authorized to act on behalf of the entity each represents.
- 32 2. The attendance shall be from the required attendance list in 3.1.D. above.
- 33 B. The General Contractor Project Manager (GCPM) shall:
- 34 1. Schedule and conduct all construction progress meetings biweekly or more frequently as required.
- 35 2. Prepare agenda for meetings including, but not limited to the following:
- 36 a. Safety
- 37 b. Current Schedule, including review of the critical path and 6-week look ahead schedule
- 38 c. Status of project related documentation (Submittals, RFIs, CBs, etc.)
- 39 d. Quality Observation Log and status of correction of deficient items
- 40 e. Project questions and issues from meeting attendees
- 41 f. BPW Administration Check
- 42 g. Other as needed
- 43 h. Status of CORs and COs to be reviewed outside the standard progress meeting time.
- 44 3. Make physical arrangements for meetings.
- 45 4. GCPM to post meeting agendas to the appropriate libraries on the Project Management Web Site
- 46 (PMWS) no less than two (2) working days prior to the scheduled meeting. Notify all required attendees,
- 47 applicable parties to the contract, and others affected of the posted meeting agenda.
- 48 5. Preside at meetings.
- 49 6. Route a meeting attendance roster for attendees to sign-in on.
- 50 7. GCPM to record the minutes of the meeting; include significant proceedings and decisions. Post meeting
- 51 minutes to the PMWS no more than two (2) working days after the completed meeting. Meeting
- 52 minutes shall include a scanned copy of the attendance sign-in sheet. Notify all required meeting
- 53 attendees, applicable parties to the contract, and others affected by decisions made at the meetings.
- 54 8. The above requirements do not apply to GC/sub-contractor meetings.
- 55

56 **3.4. PRE-INSTALLATION MEETINGS**

- 57 A. The GCPM shall schedule and conduct all pre-installation meetings, including mockup reviews, before each
- 58 construction activity that requires coordination with other trades.

- 1 B. The GCPM shall be responsible for the final agenda and meeting minutes.
- 2 C. The GCPM will work with all concerned parties to resolve issues as needed and submit RFI's if necessary.
- 3 D. Required attendance shall be from the list in 3.1.D. above and shall be personnel having a stake in the outcome
- 4 of the installation or knowledge of the system being installed.
- 5 E. In the event the Contractor installs equipment or materials without a pre-installation meeting the Contractor
- 6 shall be solely responsible for removing, replacing, repositioning materials and equipment as instructed by the
- 7 Project Architect or City Project Manager at no additional cost to the City.
- 8

9 **3.6 PRE-CONTRACT CLOSEOUT MEETINGS**

- 10 A. Two (2) Pre-contract Closeout Meetings shall be held to review the closeout procedures, requirements, and
- 11 contract deliverables.
 - 12 1. Pre-contract Closeout Meeting #1 shall be scheduled prior to the 50% Progress Payment Request is being
 - 13 requested. This meeting shall discuss items such as closing out QMO reports, providing O&M drafts and
 - 14 finals, payroll and Affirmative Action documentation, and other contract deliverables.
 - 15 2. Pre-contract Closeout Meeting #2 shall be scheduled prior to the 80% Progress Payment Request is being
 - 16 requested. This meeting shall discuss, but not be limited to, the status of scheduling final regulatory
 - 17 inspections, cleaning up outstanding QMO's, demonstration and training, attic stock; and finalization
 - 18 review of payroll and other related documents.
- 19 B. The GCPM shall schedule, coordinate, and make physical arrangements for both meetings.
- 20 C. All of the following shall be required to attend both meetings:
 - 21 1. The GCPM and the GC Field superintendent
 - 22 2. All Subcontractor Project Managers regardless of the current status of their work.
 - 23 a. The GCPM may excuse a Subcontractor PM if he is confident that all contractual requirements for
 - 24 closeout by the subcontractor have been completed and/or delivered to the GCPM. The list of
 - 25 attendees shall be reviewed and agreed upon with CPM ahead of the meeting.
 - 26 b. At the option of these project managers the field supervisors may also attend.
 - 27 3. The Project Architect and at least one design consultant from each discipline represented by the plans
 - 28 and specifications to address open QMOs, final tests, reports, etc.
 - 29 4. The Owner
 - 30 5. The CPM
 - 31 6. Quality Management staff as needed to address open QMOs, final tests, reports, etc.
 - 32 7. The Commissioning Agent
- 33 D. The CPM shall publish an agenda and chair the meeting.
- 34

35 **3.7 OTHER SPECIAL MEETINGS**

- 36 A. The Contractor shall schedule special meetings per the requirements of the LEED Specification, the Project
- 37 Quality Management Plan, the Commissioning Plan and as indicated by other specifications.
- 38 B. Special meetings include but are not limited to the following:
 - 39 1. Waste Management Conference
 - 40 2. Equipment start up meetings
 - 41 3. Testing and balancing meetings
 - 42 4. Commissioning meetings
 - 43 5. Other meetings as necessitated by the contract documents
- 44
- 45
- 46
- 47

END OF SECTION

**SECTION 01 31 23
PROJECT MANAGEMENT WEB SITE**

1
2
3
4 PART 1 – GENERAL 1
5 1.1. GENERAL DESCRIPTION 1
6 1.2. SHAREPOINT PROCEDURE OVERVIEW 1
7 1.3. RELATED SPECIFICATIONS 2
8 PART 2 - PRODUCTS 2
9 2.1. SHAREPOINT SYSTEM RELATED PRODUCTS 2
10 PART 3 - EXECUTION 2
11 3.1. POST BID-OPENING 2
12 3.2. POST PRE-CONSTRUCTION MEETING 3
13

PART 1 – GENERAL

1.1. GENERAL DESCRIPTION

- 17 A. The City of Madison (CoM) has established a web based Project Management Tool (PMT) using a Microsoft
18 product called SharePoint (SP).
19 B. The software is used throughout the design, construction and warranty process of major remodels and new
20 construction projects executed as a City of Madison, Board of Public Works project.
21 C. Initially deployed in mid 2013, the PMT software has been successfully deployed on several projects, and we
22 continue to modify/update/enhance the PMT on a regular basis.

1.2. SHAREPOINT PROCEDURE OVERVIEW

- 25 A. The CoM PMT is a system of consolidated Document & Form Libraries and Data Lists that assist in performing
26 day to day functions of design/construction management while reducing the use of surface mail, email and email
27 attachments.
28 1. Document libraries store a wide variety of documents in many different formats including but not limited
29 to Word, Excel, PDF, photographs (all popular formats), etc.
30 2. Data Lists contain consolidated data information that can be generated and stored for further use. Punch
31 Lists and Warranty issues will be examples of Data Lists.
32 3. Form libraries contain snapshot information associated with a particular Data Entry form. An example of
33 this is the Quality Management Observation form.
34 B. The following libraries and sub-libraries on the PMWS are provided for specific workflows and contract
35 documentation. Related specification numbers are in "()" if applicable.
36

Contract Documents	Construction Administration	Construction Progress	LEED Documentation	Quality Control	Construction Closeout
<i>Signed Contract</i>	<i>Change Order Requests (COR Form) (01 26 57)</i>	<i>Schedules (01 32 16)</i>	<i>LEED Documents</i>	<i>Regulatory Inspections</i>	<i>Misc Closeout Documents</i>
<i>GC Partial Pay Apps (01 29 76)</i>	<i>Change Orders (CO Form) (01 26 63)</i>	<i>Progress Meetings (01 31 19)</i>	<i>Waste Management (01 74 19)</i>	<i>Commissioning Checklists</i>	<i>O & M Manuals (01 78 23)</i>
<i>Construction Documents</i>	<i>Construction Bulletins (CB Form) (01 26 46)</i>	<i>Daily Journal (DJ Form) (01 32 26)</i>		<i>System Performance Tests</i>	<i>Product Warranties /Guarantees (01 78 36)</i>
<i>Regulatory Documents</i>	<i>Request for Information (RFI Form) (01 26 13)</i>			<i>Quality Management Observation (QMO Form) (01 45 16)</i>	<i>As-Builts (01 78 39)</i>
<i>Testing Contract</i>	<i>Submittals (SUB Form) (01 33 23)</i>			<i>Safety and Incident Reports</i>	<i>Attic Stock (01 78 23)</i>
				<i>Material Testing & Field Reports</i>	<i>Demonstration and Training (01 79 00)</i>
					<i>Warranty Issues (WI Form) (01 78 23)</i>

- 1
2 C. A tutorial document on the web based PMT will be provided to the General Contractor (GC) who is awarded the
3 contract. Additional training will be provided as needed for the GC and Sub-Contractors (SC) by the CoM.
4 D. The PMT has predefined work flows that channel automated alerts as documents are uploaded, reviewed, and
5 completed. These workflows are designed for inbound information from the contractor as well as outbound
6 information from the Architectural/Engineer consultant and the Owner.
7 E. The GC will be required to receive email notifications, access the internet to review related documentation and
8 be able to upload/download documentation to the various project libraries.
9 F. The SC's will be required (at a minimum) to receive email notifications and access the internet to review related
10 documentation. Prior to setting up the final PMT the GC and CPM shall meet to review all SP workflows, the GC
11 will determine to what level over the minimum requirements the SC's will be involved.
12

13 1.3. RELATED SPECIFICATIONS

- 14 A. The following specification sections are directly related to the CoM PMT system.
15 1. 01 26 13 Request for Information (RFI)
16 2. 01 26 46 Construction Bulletins (CB)
17 3. 01 26 57 Change Order Request (COR)
18 4. 01 26 63 Change Order (CO)
19 5. 01 29 76 Progress Payment Procedures
20 6. 01 31 19 Project Meetings
21 7. 01 32 16 Construction Progress Schedules
22 8. 01 32 26 Construction Progress Reporting
23 9. 01 32 33 Photographic Documentation
24 10. 01 33 23 Submittals
25 11. 01 45 16 Field Quality Control Procedures (Owner)
26

27 PART 2 - PRODUCTS

28 2.1. SHAREPOINT SYSTEM RELATED PRODUCTS

- 29 A. SharePoint is a Microsoft Windows based software that requires no additional software installation, hardware or
30 other special requirements/applications for the users. There are no costs associated with the use of this system.
31 B. Currently the CoM is using SharePoint 2010.
32 1. SharePoint works best if the user's computer is running Windows versions 7 through 8.1.
33 2. SharePoint works best when used with Internet Explorer versions 7, 8 and 9 (32 bit).
34 a. At this time SharePoint is not fully supported by Internet Explorer versions 10 and 11.
35 b. At this time SharePoint is not entirely compatible with other internet browsers such as Fire Fox,
36 Google Chrome, and Safari.
37
38

39 PART 3 - EXECUTION

40 3.1. POST BID-OPENING

- 41 A. After bids have been opened, a successful bidder has been determined, and bid acceptance procedures have
42 been initiated the City Project Manager (CPM) will contact the GC to provide the following information.
43 1. Project Management Software Tutorial. This tutorial is in a PDF printable format with screen shots and
44 associated instructions on how to access and use the PMT.
45 a. Tutorial instructions will include but not be limited to the following:
46 i. Descriptions of various libraries, documents, and forms that will be used throughout the
47 construction project.
48 ii. Uploading procedures for various types of documents including standardized naming
49 conventions.
50 2. A blank Project Directory in an Excel spread sheet format. The contractor shall provide the following
51 information for GC and SC staffs as indicated on the spreadsheet. This will generally be the Project
52 Manager for the GC as well as the Sub-contractors and the GC Site Supervisor.
53 a. Last Name, First Name
54 b. Company Name
55 c. Email address (valid, work related)
56 d. Work Phone Number (required, include area code)
57 e. Cell Phone Number (not required, include area code)
58

- 1 3. The GC shall provide the above information for all SC's where the GC is not self-performing the work.
2 4. The GC may provide project foreperson information for work being self performed if he/she so desires.
3

4 **3.2. POST PRE-CONSTRUCTION MEETING**

- 5 A. The GCPM will return the completed Project Directory spread sheet to the CPM no later than the Pre-
6 construction meeting.
7 B. The CPM is responsible for uploading all project directory data into SharePoint and coordinating with CoM
8 Information Technology (CoM-IT) for creating the logins and passwords of non-city staff (GC/SC staffs).
9 C. All GC/SC staff will be notified through an automated email from CoM IT that logins and passwords are available.
10 It is the responsibility of each GC/SC to call the CoM-IT number provided in the email to receive his/her
11 login/password over the phone. Logins and passwords will not be released via email.
12 D. Once the GCPM has received his/her login/password uploading of contract related documents can begin. This
13 would include but not be limited to project schedules, submittals, RFI's, and other documents as needed.
14 E. All workflows, review of documentation, and general archiving of construction related documentation will be
15 conducted on the PMWS. These documents will generally not be emailed.
16 F. The following documents related to the execution of the contract will not be part of the PMWS:
17 1. All documentation related to executing the contract, such as:
18 a. Sub Contractors list
19 b. Affirmative Action documentation
20 c. Bonding documentation
21 d. Documentation associated with payroll verification
22 e. Final documentation associated with closing out the contract
23 2. Any documentation required/generated by ordinance, code or statute, such as;
24 a. Erosion Control inspections
25 b. Building Inspection Department inspections
26
27
28
29

END OF SECTION

**SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING**

1
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3
4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATION SECTIONS 1
7 1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS 1
8 PART 2 – PRODUCTS - THIS SECTION NOT USED 1
9 PART 3 - EXECUTION 1
10 3.1. DAILY PROGRESS JOURNAL 1
11 3.2. CONSTRUCTION PROGRESS MEETINGS 2
12

PART 1 – GENERAL

1.1. SUMMARY

- 16 A. Daily records of project activities, resources used, weather conditions, and other information related to the
17 ongoing progress of the project are extremely important at all levels of Construction Management.
18 B. Daily records provide the base for weekly progress reports and updating progress schedules.

1.2. RELATED SPECIFICATION SECTIONS

- 21 A. Section 01 31 19 Project Meetings
22 B. Section 01 31 23 Project Management Web Site
23 C. Section 01 32 23 Photographic Documentation
24

1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

- 26 A. The General Contractor (GC) shall be responsible for all Construction Progress Reporting as outlined in this and
27 other specifications as noted.
28 B. The GC shall maintain daily progress journals in a format of his/her choosing provided it is legible and contains
29 the information as outlined in Section 3.1 below.
30 C. The journal shall be located in the job trailer and shall be reviewable by the Project Architect or City Project
31 Manager if so requested.
32

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. DAILY PROGRESS JOURNAL

- 38 A. The GC shall maintain a daily progress journal of daily Work activities for each day on which Work is performed
39 by any employee or entity for which the GC is responsible. Such reports shall include all relevant data
40 concerning the progress of Work activities the GC and Subcontractors are responsible for and the effect of that
41 activity on the time of performance of the Contract.
42 B. Journal entries shall be made on the Daily Work Report Form located in the Construction Progress-Daily Journal
43 Library on the Project Management Web Site. The form consists of the following areas:
44 1. Weather; include temperature, humidity, precipitation, wind and other related information such as
45 significant storm events, times, and details.
46 2. Work completed by trade
47 3. Delays encountered
48 4. Deliveries received or delayed
49 5. Hot issues that need to be addressed
50 6. Safety issues
51 7. Photograph progress and upload to the Photo Library on the Project Management Web Site.
52 8. Other including inspections, testing, etc.
53 9. Space for attaching documents
54 C. Daily Work activity reports shall be completed and signed by the GC's Job Superintendent or other on-site
55 representative authorized by the GC confirming each such report is current, accurate and complete.
56 D. If applicable the GC shall include schedules of quantities and costs, progress schedules, wage rates, reports,
57 estimates, invoices, records and other data as requested by the CPM concerning Work performed or to be

1 performed under this Contract if the CPM determines such information is needed to substantiate Change Order
2 proposals, claims, or to resolve disputes.
3

4 **3.2. CONSTRUCTION PROGRESS MEETINGS**

5 A. The GC shall provide a verbal summary of the previous two (2) weeks progress reports at each bi-weekly
6 construction progress meeting.
7

8
9

END OF SECTION

**SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULES**

1
2
3
4 PART 1 – GENERAL 1
5 1.1. SCOPE 1
6 1.2. RELATED SPECIFICATIONS 1
7 PART 2 – PRODUCTS – THIS SECTION NOT USED 1
8 PART 3 - EXECUTION 1
9 3.1. OVERALL PROJECT SCHEDULE (OPS) 1
10 3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS) 1
11 3.3. PROJECT MANAGEMENT WEB SITE (PMWS) 2
12

PART 1 – GENERAL

1.1. SCOPE

- 16 A. This specification is to identify various project related schedules associated with indicating construction progress
17 and outlook. The following schedules are the responsibility of the General Contractor (GC).
18 1. Overall Project Schedule
19 2. 6 Week Look-out Schedule
20 B. This specification is not intended to include internal schedules generated by the contractors during their
21 planning and execution of the contract.
22

1.2. RELATED SPECIFICATIONS

- 23 A. Section 01 29 76 Progress Payment Procedures
24 B. Section 01 31 23 Project Management Web Site
25 C. Section 01 31 19 Progress Meetings
26 D. Section 01 74 13 Progress Cleaning
27 E. Section 01 77 00 Closeout Procedures
28 F. Section 01 78 23 Operation and Maintenance Data
29 G. Section 01 78 36 Warranties
30 H. Section 01 78 39 As-Built Drawings
31 I. Section 01 78 43 Spare Parts and Extra Materials
32 J. Section 01 79 00 Demonstration and Training
33 K. Other specification within the construction documents that may indicate the need for scheduling any event with
34 Owner, Project Architect, Owner Representatives, including any owner provided equipment.
35
36

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL PROJECT SCHEDULE (OPS)

- 41 A. The GC shall prepare an OPS that covers the duration of the contract from the pre-construction meeting through
42 the end of construction to final contract closeout.
43 1. The GC shall review Specification 01 77 00 Closeout Procedures to become familiar with definitions,
44 differences, and requirements for closing out the construction and contract including the association with
45 progress payments.
46 B. The GC shall provide copies and lead a discussion on the OPS during the pre-construction meeting.
47 C. The OPS shall indicate start and end dates of each task associated with the project.
48 D. The OPS shall clearly indicate the critical path of the project.
49 E. The GC shall update the OPS as often as necessary during the duration of the project. Updates will be briefed as
50 needed during bi-weekly progress meetings.
51
52

3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)

- 53 A. The GC shall prepare the initial LOS to include detail of daily tasks for the first six (6) weeks of construction in
54 depth for the Pre-construction meeting. The LOS shall be compatible and complimentary to the OPS.
55 B. The GC shall provide copies and lead a discussion on the LOS during the pre-construction meeting.
56 C. The LOS shall indicate start and end dates of each major task, associated related sub-tasks, and required parallel
57 or pre-requisite tasks required to complete the major task on time.
58

- 1 D. The LOS shall also include identifying and scheduling such events as:
2 1. Pre-installation meetings and mock-up review meetings.
3 2. Quality management reviews of installations before they are covered.
4 3. Owner provided equipment as designated by the contract documents.
5 4. Work by others as designated by the contract documents.
6 5. Critical submittal dates.
7 E. The GC shall update the LOS prior to each bi-weekly progress meeting to indicate the next 6 weeks of scheduled
8 work. Updates will be briefed during each bi-weekly progress meeting.
9

10 **3.3. PROJECT MANAGEMENT WEB SITE (PMWS)**

- 11 A. The GC shall upload all project schedules and updates to the PMWS in an original PDF version of the scheduling
12 document. Scans will not be permitted.
13

14
15

END OF SECTION

**SECTION 01 32 19
SUBMITTALS SCHEDULE**

1
2
3
4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED SPECIFICATIONS 1
7 1.3. RELATED DOCUMENTS 1
8 1.4. SUBMITTAL DEFINITIONS 1
9 1.5. SUBMITTAL REQUIREMENTS 1
10 1.6. ADMINISTRATIVE SUBMITTALS 2
11 PART 2 – PRODUCTS – THIS SECTION NOT USED 2
12 PART 3 - EXECUTION 2
13 3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS 2
14 3.2. GENERAL CONTRACTORS RESPONSIBILITIES 2
15 3.3. STAFF REVIEW RESPONSIBILITIES 3
16

PART 1 – GENERAL

1.1. SUMMARY

- 20 A. The General Contractor shall submit a complete and comprehensive list of all submittals anticipated during the
21 execution of this contract.
22 B. The GC shall include the Administrative submittals identified in item 1.5 below and shall be required to up load
23 them to the Project Management Web Site.
24 C. The initial Submittals Schedule shall be based on the original contract documents used at the time of bidding and
25 any posted addenda through awarding of the contract.
26 D. The Submittal Schedule may be appended during the execution of the contract based on amendments to the
27 contract in the form of Change Orders, Construction Bulletins, and other related documents that add, or change
28 the scope of the work.
29

1.2. RELATED SPECIFICATIONS

- 30 A. Section 01 29 76 Progress Payment Procedures
31 B. Section 01 31 23 Project Management Web Site
32 C. Section 01 33 23 Submittals
33
34

1.3. RELATED DOCUMENTS

- 35 A. The following documents shall be used as the basis for initiating the original Submittals Schedule.
36 1. Drawing documents and specifications (including general provisions) as provided with the bid set
37 documents and any published addenda.
38 B. The following documents shall be used to amend the submittals schedule as needed during the execution of this
39 contract.
40 1. Documents associated with revisions or clarifications to number A.1 above after awarding of the
41 contract, including but not limited to:
42 a. Construction Bulletins
43 b. Approved Change Orders
44
45

1.4. SUBMITTAL DEFINITIONS

- 46 A. Administrative Submittal: Any submittal that may be required by a Division 1 Specification and as noted in
47 Section 1.5 below.
48 B. Critical Path Submittal: Any early submittal that needs a priority review due to early construction use or long
49 lead times where a delay could affect the critical path of the construction schedule
50 C. Submittal: Any material, product, equipment, or general requirement as outlined in this and other specifications
51 that require a favorable review or acceptance prior to proceeding with procuring the item or proceeding with
52 the Work.
53
54

1.5. SUBMITTAL REQUIREMENTS

- 55 A. The GC and all Sub-contractors shall review the construction documents including the specifications of their
56 individual Division or Trade to compile a complete list of all materials, products, or equipment that will require a
57 positively reviewed submittal to be completed prior to procurement and installation.
58

- 1 1. Submittals shall include but not be limited to any of the following that may apply:
 2 a. Shop Drawings
 3 b. Product Data
 4 c. Assembly Drawings
 5 d. Engineered Drawings
 6 e. Product Samples
 7 B. The following items will require an approved submittal, verify with specifications for specific needs and
 8 requirements:
 9 1. Contractor certifications for specialized work such as asbestos removal, well drilling, controls, AV, etc.

11 **1.6. ADMINISTRATIVE SUBMITTALS**

- 12 A. The GC shall upload the following submittals within 15 working days of receipt of the City of Madison Start Work
 13 Letter. All Administrative Submittals shall be approved prior to requesting Progress Payment Number 1.
 14 1. Contractors Project Directory, see specification 01 31 23, discuss requirements with CPM
 15 2. Schedule of Values, see Specification 01 29 73
 16 3. Submittals Schedule, see Specification 01 32 19
 17 4. Waste Management Plan, see Specification 01 74 19
 18 5. Closeout Requirement Checklist, see Specification 01 77 00
 19 6. Warranty Checklist, see Specification 01 78 36

21 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

23 **PART 3 - EXECUTION**

25 **3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS**

- 26 A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work
 27 to provide a complete and comprehensive list of submittals to the General Contractor.
 28 B. Each list shall indicate the title of the submittal, the associated specification of the submittal, whether the
 29 submittal can be considered an early/middle/late submittal, the anticipated date the submittal will be provided
 30 and the anticipated date the submittal needs to be approved.
 31 C. Contractors shall be aware that the goals for submittal review by the Architect staff and City staff will be as
 32 follows:
 33 1. For items on the Critical Path as identified by the GC, five (5) working days
 34 2. For most other submittals ten (10) working days
 35 3. Additional time may be needed for complex submittals or if re-submittals are required.
 36 D. The general format of the Submittal Schedule shall be tabular as per this example:

<u>Title</u>	<u>Specification</u>	<u>Critical Path (Y or N)</u>	<u>Date provided</u>	<u>Date required</u>	<u>Remarks</u>
Concrete Mix Design	03 30 00	Y	Oct 1, 2014	Oct 15, 2014	
Paint Draw Downs	09 90 00	N	Jan 2, 2015	Jan 20, 2015	

39 **3.2. GENERAL CONTRACTORS RESPONSIBILITIES**

- 40 A. The General Contractor shall be responsible for all of the following:
 41 1. Consolidating all submittal lists from individual contractors into one master list.
 42 2. Reviewing all submitted lists for completeness, timing with the overall contract, etc. The GC shall meet
 43 with individual contractors to make changes as necessary.
 44 3. Upload the completed Submittals Schedule to the Submittal Library on the Project Management Web Site
 45 for review as SD 003.0. See Specification 01 33 23 Submittals for more information on this procedure.
 46 4. Resubmit the schedule as needed after initial reviews have been completed.
 47 B. The GC shall work with other contractors to amend the Submittals Schedule throughout the execution of the
 48 project based on changes and modifications as needed.
 49 C. The GC and Project Architect shall be responsible for reviewing and briefing the submittal schedule and
 50 submittals status at each bi-weekly construction meeting.
 51

- 1 **3.3. STAFF REVIEW RESPONSIBILITIES**
2 A. The Project Architect, consulting staff, Owner, and city staff will review the Submittal Schedule for completeness
3 per the plans and specifications within their divisions of work. The reviewing staff may provide comments as
4 needed. Some examples might include the following:
5 1. Submittal not required
6 2. Provide photos of samples with digital submittal
7 3. Insure one submittal for complete system
8 4. Append the schedule to include...
9 5. See Specification <xyz> for additional requirements
10 B. The Project Architect and City Project Manager will finalize review comments regarding the Submittal Schedule.
11 Re-submittal of the submittal schedule may be required.

12
13
14
15

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

1
2
3
4 PART 1 – GENERAL 1
5 1.1. SCOPE 1
6 1.2. RELATED SPECIFICATION SECTIONS 1
7 PART 2 – PRODUCTS - THIS SECTION NOT USED 1
8 PART 3 - EXECUTION 1
9 3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS..... 1
10 3.2. PICTURE CONTENT 1
11 3.3. PROJECT MANAGEMENT WEB SITE..... 1
12

PART 1 – GENERAL

1.1. SCOPE

- 16 A. The General Contractor (GC) shall be required to take weekly digital photographs of construction progress and
17 upload the photos directly to the Project Management Web Site (PMWS).
18

1.2. RELATED SPECIFICATION SECTIONS

- 20 A. Section 01 31 23 Project Management Web Site
21 B. Section 01 32 26 Construction Progress Reporting
22

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS

- 28 A. All digital photographs shall be taken with a good quality digital camera, cell phone, tablet, and other such digital
29 device.
30 B. Digital photographs shall be properly zoomed in/out to capture a specific level of detail as necessary.
31 C. Digital photographs shall be formatted to achieve a good, clear, and detailed image where the final file size is
32 between 600 KB and 1.2 MB (1200KB).
33 D. The camera default naming convention is acceptable. The GC does not need to rename or specifically identify
34 pictures in the title.
35 E. All digital photographs shall be saved in a JPEG (.jpg) format and uploaded directly to the PMWS.
36

3.2. PICTURE CONTENT

- 38 A. The GC shall take exterior photographs from at least two (2) different angles.
39 1. This requirement shall only be applicable when there is exterior work connected with the project.
40 2. When applicable this requirement shall begin prior to commencing any site work.
41 3. This requirement shall end when the exterior work has been substantially completed.
42 4. This requirement may be suspended due to weather conditions or substantial delays in exterior progress.
43 B. The GC shall take interior photographs of interior construction, equipment installation, rough-ins and other such
44 progress that helps document weekly progress reporting. Interior photographs should focus on specific
45 significant installations as well as general progress throughout the progress of the contract.
46

3.3. PROJECT MANAGEMENT WEB SITE

- 48 A. The GC shall upload the digital photographs to the appropriate progress folder in the Project Images Library.
49 B. Progress folders are labeled with the Construction Week Number and the date for Monday of that week.
50 C. The GC shall notify the City of Madison Project Manager if additional progress folders need to be created.
51
52
53

END OF SECTION

SECTION 01 33 23
SUBMITTALS

1
2
3
4 PART 1 – GENERAL 1
5 1.1. SUMMARY 1
6 1.2. RELATED REFERENCES 1
7 1.3. SUBMITTAL REQUIREMENTS 1
8 PART 2 – PRODUCTS – THIS SECTION NOT USED 2
9 PART 3 - EXECUTION 2
10 3.1. GENERAL CONTRACTORS PROCEDURES 2
11 3.2. SUBMITTAL REVIEW 2
12 3.3. PROJECT ARCHITECTS REVIEW 3
13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. The General Contractor (GC) shall be responsible for providing submittals for review of all contractors and sub-
18 contractors as designated in the construction documents. Submittals shall include but not be limited to all of the
19 following:
20 1. Equipment specified and pre-approved in the specification; to ensure quality, construction, and
21 performance specifications have not changed since final design.
22 2. Equipment specified by performance in the specification; to ensure that the intended quality,
23 construction, and performance specified is met by the selected material or product.
24 3. Shop, piece, erection, and other such drawings as indicated in the specifications to ensure all structural,
25 dimensional, and assembly requirements are being met.
26 4. Submittals indicating installation sequencing
27 5. Submittals indicating control sequencing
28 6. Contractor licensing, certification, and other such regulatory documentation when required by a
29 specification.
30 7. Other submittals as may be required by individual specifications.
31 B. The submittal process shall not be used to determine alternates to specified products or equipment. All
32 considerations shall be reviewed during the bidding process and acceptable alternates shall be acknowledged by
33 addendum prior to the closing of bidding. See bidding instructions for the information on submitting alternates
34 for consideration.
35 D. In the event that a manufacturer has significantly changed a product (discontinued a model, changed dimension
36 or performance data changed available colors, etc.) since bid opening the GC shall submit a Request for
37 Information (RFI) to the Project Architect requesting other approved alternates prior to uploading a digital
38 submittal.
39 E. Contractors and sub-contractors shall be responsible for knowing the submittal requirements of ALL sections
40 within their scope of work under the contract. The Owner reserves the right to request documentation on any
41 materials, equipment, or product being installed where a submittal is not on file. If the material, equipment, or
42 product installed is determined not to meet the intent of the specification the contractor/sub-contractor shall be
43 required to remove and replace the items involved. The GC shall be solely responsible for all costs associated
44 with the removal and replacement.
45

1.2. RELATED REFERENCES

- 46 A. Section 01 29 76 Progress Payment Procedures
47 B. Section 01 31 23 Project Management Web Site
48 C. Section 01 32 19 Submittals Schedule
49 D. Section 01 32 26 Construction Progress Reporting
50 E. All Technical Specifications, contract documents, construction drawings, and any published addendums during
51 the bidding process.
52 F. All contract documents generated during the execution of the contract including but not limited to Requests for
53 Information (RFI) and Construction Bulletins (CB).
54
55

1.3. SUBMITTAL REQUIREMENTS

- 56 A. A completed submittal shall meet the following requirements:
57

- 1 1. Digital submittal shall be original PDF of manufacturer's data sheets or high quality color scan of the
2 same.
- 3 a. Submittals shall not include sales fliers or other similar documents that typically do not provide
4 complete manufacturers data.
- 5 2. Documents within the PDF submittal shall be printable to a sized sheet no less than 8-1/2 by 11 inches
6 and no larger than 24 by 36 inches.
- 7 3. At the beginning of each submittal the contractor shall identify the plan reference (WC-1, EF-3, etc.) in
8 RED block letters that the submittal is for.
- 9 4. Where multiple model numbers appear in a table the contractor shall identify the specific model being
10 submitted by using a RED square, box, or other designation to distinguish the correct model from others
11 on the page.
- 12 B. A complete submittal will include all information associated with the product or equipment as presented in
13 plans, equipment tables, and specifications. Information shall include but not be limited to the following:
 - 14 1. Dimensional data
 - 15 2. Performance data
 - 16 3. Resource requirements, power, water, waste, etc
 - 17 4. Clearance and maintenance requirements
 - 18 5. Finish information, colors, textures, etc.
 - 19 6. Warranty information
- 20 C. Where a submittal includes material samples (carpet, tile, paint draw downs, etc.) the contractor shall do the
21 following:
 - 22 1. The Contractor shall submit the sample(s) as indicated in the specification.
 - 23 2. The Contractor shall include a quality photograph(s) of the product with the digital submittal.
24 Photographs shall meet the following requirements:
 - 25 a. Formatted to be between 500Kb and 1.0 Mb in file size
 - 26 b. Have no glare or flash reflection on the sample
 - 27 c. Sample fills the frame of the photo and shows detail as needed. Include multiple photos from
28 other angles as needed.
 - 29 d. Scanned copies of products or photos are not acceptable.
- 30 D. Uploaded submittals should be relative and related to a specific written specification.
 - 31 1. Do not upload submittals under a broad category or division (I.E. HVAC 23 00 00). Always upload by the
32 specific specification that identifies a required product or performance to be met.
 - 33 2. Group related items together if the specification is written that way. (I.E. all of the plumbing fixtures and
34 trim relative to one specific specification should be submitted together).

35
36 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

37
38 **PART 3 - EXECUTION**

39
40 **3.1. GENERAL CONTRACTORS PROCEDURES**

- 41 A. All required submittals will be uploaded to the Construction Administration-Submittal Drawings Library on the
42 Project Management Web Site (PMWS) by the GC.
 - 43 1. The GC shall open a new Submittal Form in the Submittals Drawings Library for each required submittal
44 from the Submittals schedule.
 - 45 2. Fill in required information on the form that will be used for routing the review and comments.
 - 46 3. Attach all documentation as described in Section 1.3 above.
 - 47 a. Submit samples under separate cover to the Project Architect when necessary.
- 48 B. Uploading the submittal indicates that the GC has reviewed and approved the submittal against the contract
49 document requirements.
- 50 C. The GC shall discuss submittal status at all progress meetings and shall monitor submittal review/approval/re-
51 submittal so as to not incur delays in the project schedule.
- 52 D. A completed upload of the submittal to the PMWS initiates the review process workflow.
- 53 E. The GC and sub-contractors shall provide re-submittals as required.

54
55 **3.2. SUBMITTAL REVIEW**

- 56 A. Upon completion of the submittal upload by the GC the PMWS automatically notifies the appropriate
57 Architect/Engineer and Owner Representative by Division/Specification number that there is a submittal for
58 review.

- 1 B. The submittal shall be reviewed internally by the required Architect/Engineer and Owner Representative in a
2 timely fashion and provide commentary on missing items, incorrect information, or incomplete shop drawings,
3 etc as needed.
4 C. When the internal review is completed the PMWS will notify the Project Architect the submittal is ready for final
5 review.
6

7 **3.3. PROJECT ARCHITECTS REVIEW**

- 8 A. Upon completion of the internal review the Project Architect shall review all internal review comments, confer
9 with the CPM as needed and determine the appropriate disposition status for the submittal (approved or
10 resubmit).
11 C. The Project Architect shall summarize final internal review comments onto the submittal cover sheet, provide a
12 final disposition of the submittal and update the review status of the submittal to "Complete..." (with or w/o
13 comments) or "Rejected".
14 D. A completed Final Review status initiates the PMWS to notify the GC and appropriate sub-contractor(s) that the
15 review of the submittal has been completed.
16
17
18
19

END OF SECTION

**SECTION 01 43 39
MOCKUPS**

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17

PART 1 – GENERAL

1.1. SUMMARY

- A. Definition
1. Mockups are field samples constructed, applied, or assembled at the project site for review by the Owner, Owners Representative, Architect and Consultants.
 2. Mockups are three dimensional, true scale models that illustrate materials and methods, equipment, workmanship, or location; based on plans, details, and assemblies.
- B. Approved mockups establish the standard of quality by which the final work will be judged.
- C. Approved mockups shall be properly documented and entered into the Submittal Library on the Project Management Web Site like any other required submittal. See section 3.4 below for more information.

1.2. RELATED SPECIFICATIONS

- A. Section 01 26 13 Request for Information (RFI)
- B. Section 01 26 46 Change Bulletin (CB)
- C. Section 01 26 63 Change Order (CO)
- D. Section 01 31 19 Project Meetings
- E. Section 01 32 16 Construction Progress Schedules
- F. Section 01 33 23 Submittals
- G. Section 01 45 00 Quality Control

1.3. RELATED DOCUMENTS

- A. The following documents shall be used for preparing mockups.
1. All plans, specifications, and details including those derived as revisions (RFI, CB, CO).
 2. Construction Progress Schedules. Mockups shall be done and completed in a timely fashion for review and approval so as to not impact the Contractors project schedule.
 3. Any Manufacturers installation/assembly instructions.

1.4. PERFORMANCE REQUIREMENTS

- A. All Contractors shall be responsible for providing and constructing mockups as specified in their Division of Work in the plans and specifications.
- B. Materials to be used shall be as specified in the construction documents, full sized and properly assembled.
- C. Completed mockups shall be of sufficient size to provide visible detail of all components as needed for the sample.

1.5. QUALITY ASSURANCE

- A. The General Contractor (GC) shall be responsible for coordinating all of the following as needed:
1. Designating the location for the mockup construction
 2. Coordinating the work of all contractors and materials required to complete the mockup
 3. Ensuring that the mockup meets the intent of the construction documents before scheduling the mockup review meeting.

1
2 **PART 2 - PRODUCTS**

3
4 **2.1. MATERIALS**

- 5 A. The materials used in mockups shall be only those materials indicated in the plans, specifications, and favorably
6 reviewed submittals.
7 B. Mockups shall be made of full scale materials as delivered to the project site.
8 C. All materials associated with a particular detail, construction method, manufacturer's installation instructions
9 shall be properly represented and visible in the mockup. This includes but is not limited to finished mortar joints,
10 sealants, backer rods, tie bars, rebar, etc.
11

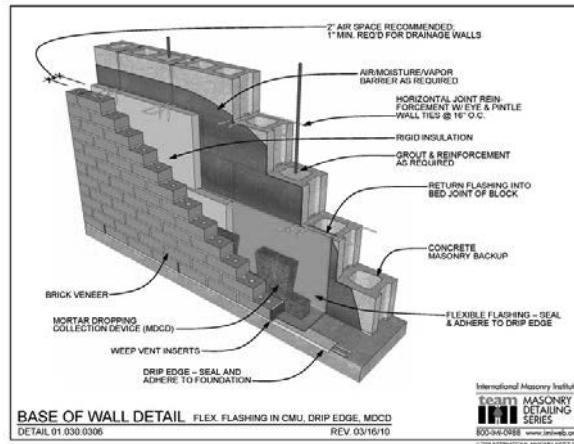
12 **PART 3 - EXECUTION**

13
14 **3.1. REVIEW THE PLANS AND SPECIFICATIONS**

- 15 A. The GC shall review the plans and specifications with all required contractors prior to constructing the mockup.
16 1. Mockups that will be built and remain in place, if favorably reviewed, will be installed in an area easily
17 accessible for review.
18 2. Mockups that will not be built in place or will not remain will be constructed in a space on the project site
19 protected from weather, construction traffic, and other such disturbances until such time as the
20 associated work has been completed.
21 3. Insure all products being represented in the mockup meet the plans, specifications, and any published
22 changes.
23

24 **3.2. MOCKUP CONSTRUCTION**

- 25 A. Mockups shall be of sufficient size to show various material adjacencies, connectivity, patterns, and other such
26 related features.
27 B. Mockups shall be constructed in a layered fashion so that all products being used can be seen and evaluated.
28 C. The construction detail below is an example of a properly layered mockup.
29



30
31
32 **3.3. MOCKUP REVIEW**

- 33 A. The General Contractor and all associated Sub-contractors (Contracting Team) shall meet with the Owner,
34 Owners Representative, Architect and Consultants (Design Team) as necessary to review the mock-up.
35 Contractors shall be prepared to answer questions on materials and methods as necessary.
36 B. The Contracting and Design Teams shall review the mockup in detail for materials, methods, and workmanship
37 with respect to the intent of the contract documents. Improvements or adjustments shall be discussed as
38 needed.
39 C. If the mockup is incomplete or does not show sufficient detail of products and workmanship the General
40 Contractor shall resubmit a new mockup.
41 D. Re-submittal of mockups to meet the intent of the contract documents shall be the responsibility of the General
42 Contractor. No Change Orders will be processed for additional time or materials associated with re-submitting a
43 mockup for approval.

SECTION 01 45 16
FIELD QUALITY CONTROL PROCEDURES

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17

PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract
22 signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are
23 delivered for the contracted Work.
24 1. The Progress Management Web Site is a Construction Management tool that provides contractors and
25 staff a single on-line location for the daily operations and progression of the Work.
26 2. The Quality Management Observation (QMO) is an ongoing observation of the construction process as it
27 progresses. The City of Madison does not use a “Punch List” or “Corrections List” as it is typically known
28 throughout the construction industry. The QMO process acts as an “in progress punch list”.
29 a. By using the QMO process the City of Madison’s goal is to have a zero item punch list prior to the
30 90% progress payment and owner occupancy.
31 B. All contractors shall be required to review the specifications identified in Section 1.2 below, and other related
32 specifications identified therein to become familiar with the terminology and expectations of this City of
33 Madison Public Works contract.
34 C. It is the intent of this specification to outline the requirements, expectations, and responsibilities of the General
35 Contractor (GC), Project Architect, and other representatives of the Owner for items of Quality Assurance and
36 Quality Control.
37 1. This specification is not intended to conflict with Specification 01 40 00 Quality Requirements or other
38 specifications requiring testing and inspecting services.
39 2. This specification does not relieve the GC from any requirements associated with regulatory inspections
40 performed by the City of Madison Building Inspection Unit, or inspectors from other agencies as required
41 by code.
42 3. Any testing performed by an Owner’s Representative does not relieve the GC from performing any
43 testing that may be required by the construction documents.
44

1.2. RELATED SPECIFICATION SECTIONS

- 46 A. Section 01 26 13 Request for Information (RFI)
47 B. Section 01 29 76 Progress Payment Procedures
48 C. Section 01 31 13 Project Coordination
49 D. Section 01 31 23 Project Management Web Site
50 E. Section 01 40 00 Quality Requirements
51 F. Section 01 77 00 Closeout Procedures
52 G. Section 01 78 13 Completion and Correction List
53

1.3. PERFORMANCE REQUIREMENTS

- 55 A. All contractors shall be responsible for a proper quality assurance/quality control (QA/QC) program throughout
56 the execution of the Work defined within the construction documents, including all recognized construction
57 industry standards and all applicable regulatory codes.
58 B. The GC shall be responsible for all of the following:

- 1 1. Monitor the quality of all workmanship, supplies, materials, and products being installed by all
- 2 contractors and installers to ensure they meet or exceed the minimum requirements set forth by the
- 3 construction documents.
- 4 2. Submit a Request for Information (RFI) whenever manufacturers' instructions or referenced standards
- 5 conflict with the construction documents before proceeding with the Work.
- 6 3. Ensure that Work requiring special certifications or licensing is being performed by is being performed
- 7 and supervised by personnel that meet the appropriate requirements.
- 8 a. Ensure that all certificates and licenses are current throughout the execution of the project.
- 9 C. The CoM and its representatives shall perform quality assurance and quality control activities throughout the
- 10 execution of this project. This in no way relieves the GC of maintaining an acceptable QA/QC program. =
- 11

12 **1.4. QUALITY ASSURANCE**

- 13 A. The GC shall be responsible for the following:
 - 14 1. All materials, equipment, and products shall be new, clean, undamaged, and meet the performance
 - 15 specifications defined within the construction documents including favorably reviewed submittals.
 - 16 a. Any material, equipment, or product that does not meet the requirements of the construction
 - 17 documents shall be removed and replaced, including any adjacent and related work, at the GCs
 - 18 expense.
 - 19 2. All Work shall be performed by persons properly trained and/or qualified to produce workmanship of the
 - 20 quality specified in the construction documents.
 - 21 3. Providing access to updated as-builts, addenda, submittals, bulletins and other related construction
 - 22 documents at the project site.
- 23 B. The CoM and its representatives may be responsible for any of the following:
 - 24 1. Attend pre-installation meetings
 - 25 2. Attend construction progress meetings
 - 26 3. Review all submittals
 - 27 4. Conduct field visits for QA/QC purposes, provide feedback to the GC and sub-contractors using Quality
 - 28 Management Observation (QMO) reports.
 - 29 5. Review delivered equipment
 - 30 6. Witness equipment installations, startups, testing as specified in other specifications
- 31

32 **1.5. QUALITY MANAGEMENT OBSERVATION REPORT**

- 33 A. The Quality Management Observation report or QMO is used as a QA/QC tool by those entities responsible for
- 34 QA/QC activities, including but not limited to, the GC, CoM, PA, CX agent, etc.
- 35 B. QMOs are designed to be an early observation of non-conforming construction work before it becomes buried
- 36 by follow on work. As such it is most often used as an "in progress punch list".
- 37 C. QMO forms are part of the Quality Control Library on the Project Management Web Site.
- 38

39 **PART 2 – PRODUCTS - THIS SECTION NOT USED**

40 **PART 3 - EXECUTION**

41 **3.1. QUALITY MANAGEMENT RESPONSIBILITIES**

- 42
- 43 A. While making routine progress visits to the construction project the GC, CPM, and A/E, and applicable others
- 44 shall observe the details of the construction and installations to ensure that the intent of the construction
- 45 documents is being followed.
- 46 B. If during the progress visit there is a determination of contract non-conformance a QMO report shall be initiated
- 47 to begin the documentation process.
- 48 1. The GC field superintendent shall be informed immediately of any issue that may cause harm, damage to
- 49 finished work, or be buried prior to properly filing a QMO report.
- 50 C. The following information when filing a QMO report:
 - 51 1. Open a QMO report in the Quality Control Library on the Project Management Web Site
 - 52 2. Enter the date and time of the field visit
 - 53 2. Provide references to construction documents if any (examples; specification, drawing page, details,
 - 54 approved submittals, RFI, CB, etc)
 - 55 3. Provide a short title for the observation being made
 - 56 4. Provide a detailed description of the observation being made
 - 57

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

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27

PART 1 – GENERAL

1.1. SUMMARY

- 31 A. This Section includes general procedural requirements for temporary facilities and controls including, but not
32 limited to the following:
33 1. Temporary Utilities
34 2. Telecommunications Services
35 3. Temporary Sanitary Facilities
36 4. Barriers
37 5. Fencing
38 6. Exterior Enclosures
39 7. Security
40 8. Vehicular Access and Parking
41 6. Waste Removal
42 7. Project Identification
43 8. Field Offices
44

1.2. RELATED SPECIFICATION SECTIONS

- 46 A. Section 01 31 19 Progress Meetings
47 B. Section 01 31 23 Project Management Web Site
48 C. Section 01 74 19 Construction Waste Management and Disposal
49

1.3. QUALITY ASSURANCE

- 51 A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having
52 jurisdiction, including but not limited to:
53 1. Building Code requirements
54 2. Health and safety regulations
55 3. Utility company regulations
56 4. Police, Fire Department and Rescue Squad rules
57 5. Environmental protection regulations
58 6. Joint Commission - Hospital Accreditation Standards

- 1 B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition
2 Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA
3 Electrical Design Library "Temporary Electrical Facilities".
4 C. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service.
5 Install service in compliance with NFPA 70 "National Electric Code".
6

7 **1.4. TEMPORARY UTILITIES**

- 8 A. Owner will provide the following:
9 1. Electrical power and metering, consisting of existing facilities.
10 2. Water supply, consisting of existing facilities.
11 B. General:
12 1. Existing facilities may be used.
13 2. New permanent facilities may be used.
14 C. Water Service: water is available from existing building services.
15 1. Use trigger-operated nozzles for water hoses, to avoid waste of water.
16 D. Temporary Electric Power Service: Electrical Contractor shall extend temporary power from existing building
17 services.
18 E. Temporary Lighting: Electrical Contractor shall provide temporary lighting with local switching
19 1. Install and operate temporary lighting that will fulfill security and protection requirements, without
20 operating the entire system, and will provide adequate illumination for construction operations and
21 traffic conditions
22 F. Temporary Heat: Owner provided as existing building supply and return system. All return ducts shall be HEPA
23 filtered to protect existing building system.
24

25 **1.5. TELECOMMUNICATIONS SERVICES**

- 26 A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization through
27 construction closeout.
28 B. Telecommunications services shall include:
29 1. Windows-based personal computer dedicated to project telecommunications.
30 2. Shared access to the internet via WIFI or similar wireless connection.
31 a. Access must be capable to support minimum of 10 wireless devices.
32 3. Email Account/address dedicated for GC Project Manager of GC Supervisor on site.
33

34 **1.6. TEMPORARY SANITARY FACILITIES**

- 35 A. Owner provided as existing public restrooms.
36

37 **1.7. BARRIERS**

- 38 A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be
39 hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from
40 construction operations and demolition.
41

42 **1.8. FENCING**

- 43 A. None required for this contract.
44

45 **1.9. EXTERIOR ENCLOSURES**

- 46 A. None required for this contract.
47

48 **1.10. SECURITY**

- 49 A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized
50 entry, vandalism, or theft.
51

52 **1.11. VEHICULAR ACCESS AND PARKING**

- 53 A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for
54 emergency vehicles.
55 B. Coordinate access and haul routes with governing authorities and Owner.
56 C. Provide and maintain access to fire hydrants, free of obstructions.
57 D. Existing parking areas located at Dayton Street in front of Fire Station #1 may be used for construction parking
58 until Station #1 is occupied by Owner.

1
2 **1.12. WASTE REMOVAL**

- 3 A. See Section 01 74 19 - Waste Management, for additional requirements.
4 B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
5 C. Provide containers with lids. Remove trash from site periodically.
6 D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible
7 containers; locate containers holding flammable material outside the structure unless otherwise approved by the
8 authorities having jurisdiction.
9 E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

10
11 **1.13. PROJECT IDENTIFICATION**

- 12 A. None authorized for this contract.
13

14 **1.14. FIELD OFFICES**

- 15 A. Office: Weather tight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy
16 furniture, drawing rack and drawing display table.
17 B. Field Office shall be located in Suite 340.
18 C. Provide space for Project Meetings with table and chairs to accommodate a minimum of eight (8) persons.
19 D. Provide a minimum of a 40" LCD monitor or other digital projection device to be connected to the computer
20 identified in Section 1.4 Telecommunications Services (above).
21 1. To be used during progress meetings in connection with reviewing construction progress information
22 posted to the Project Management Web Site (Specification 01 31 23) hosted by the Owner.
23

24 **PART 2 - PRODUCTS**

25
26 **2.1. TEMPORARY PARTITIONS**

- 27 A. Provide dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and
28 noise.
29 1. Non-fire rated partitions, standard
30 a. Wood stud framing, 6-mil polyethylene
31

32 **2.2. EQUIPMENT**

- 33 A. Temporary Lifts and Hoists: Contractors requiring temporary lifts and hoists shall provide facilities for hoisting
34 materials and employees.
35 B. Electrical Outlets: Electrical Contractor shall provide properly configured NEMA polarized outlets to prevent
36 insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault
37 circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
38 C. Electrical Power Cords: Contractors requiring power cords shall provide grounded extension cords; use "hard-
39 service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate
40 lengths of electric cords, if single lengths will not reach areas where construction activities are in progress. Do
41 not exceed safe length-voltage ratio.
42 D. Lamps and Light Fixtures: Electrical Contractor shall provide general service incandescent lamps of wattage
43 required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to
44 breakage. Provide exterior fixtures where exposed to moisture.
45 E. Heating Units: General Contractor shall provide temporary heating units that have been tested and labeled by
46 UL, FM or another recognized trade association related to the type of fuel being consumed.
47 F. First Aid Supplies: General Contractor shall provide first aid supplies complying with governing regulations.
48 G. Fire Extinguishers: General Contractor shall provide hand-carried, portable UL-rated, fire extinguishers of NFPA
49 recommended classes for the exposures, extinguishing agent and size required by location and class of fire
50 exposure.
51

52 **PART 3 - EXECUTION**

53
54 **3.1. TEMPORARY FIRE PROTECTION**

- 55 A. Until fire protection needs are supplied by permanent facilities, General Contractor shall install and maintain
56 temporary fire protection facilities of the types needed to protect against reasonably predictable and
57 controllable fire losses.

- 1 B. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding
- 2 Construction, Alterations and Demolition Operations".
- 3 C. Locate fire extinguishers where convenient and effective for their intended purpose.
- 4 D. Store combustible materials in containers in fire-safe locations.
- 5 E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways
- 6 and other access routes for fighting fires.
- 7 F. Prohibit smoking on the premises.
- 8 G. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition
- 9 according to requirements of authorities having jurisdiction.
- 10 H. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site
- 11 I. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods
- 12 and procedures. Post warnings and information.
- 13

14 **3.2. COLLECTION AND DISPOSAL OF WASTE**

- 15 A. Collect waste from construction areas and elsewhere daily
- 16 B. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce
- 17 requirements strictly.
- 18 C. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to
- 19 rise above 80 deg F.
- 20 D. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing
- 21 properly. Dispose of material in a lawful manner.
- 22

23 **3.3. ENVIRONMENTAL PROTECTION**

- 24 A. Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply
- 25 with environmental regulations, and minimize the possibility that air, waterways and subsoil might be
- 26 contaminated or polluted, or that other undesirable effects might result.
- 27 B. Avoid use of tools and equipment which produce harmful noise.
- 28 C. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms
- 29 near the site.
- 30

31 **3.4. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS**

- 32 A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.
- 33 B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- 34 C. Clean and repair damage caused by installation or use of temporary work.
- 35 D. Restore existing facilities used during construction to original condition.
- 36 E. Restore new permanent facilities used during construction to specified condition.
- 37
- 38
- 39
- 40

END OF SECTION

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

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PART 1 – GENERAL

1.1. SUMMARY

- 22 A. The purpose of this specification is to provide general guidelines and responsibilities related to the receiving,
23 handling, and storage of all materials and products from arrival on the job site through installation.
24 1. Immediate inspection of delivered goods means a timely replacement if damaged.
25 2. Proper storage helps prevent damage and loss by weather, vandalism, theft, and job site accidents.
26 3. Proper storage helps with job site performance and safety.
27 2. Proper handling helps prevent damage and job site accidents.
28 B. Each Contractor shall be directly responsible for the receiving, handling, and storage of all materials and
29 products associated with the Work of their Division or Trade.
30 C. Each Contractor responsible for Work associated with Owner provided materials or products shall be responsible
31 for the receiving, handling and storage of the material/product as outlined in Section 3.8 below..
32

1.2. RELATED SPECIFICATIONS

- 34 A. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
35 Works Construction”.
36 1. Use the following link to access the Standard Specifications web page:
37 <http://www.cityofmadison.com/business/pw/specs.cfm>
38 a. Click on the “Part” chapter identified in the specification text. For example if the specification
39 says “Refer to City of Madison Standard Specification 210.2” click the link for Part II, the Part II
40 PDF will open.
41 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
42 to the referenced text.
43 c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.
44 B. Section 01 57 21 Indoor Air Quality
45 C. Section 01 74 13 Progress Cleaning
46 D. Section 01 76 00 Protecting Installed Construction
47 E. Other Divisions and Specifications that may address more specifically the requirements for the storage and
48 handling of materials and products associated Work of other Divisions or Trades.
49

1.3. QUALITY ASSURANCE

- 51 A. The GC shall be responsible for ensuring that these minimum storage and handling requirements are met by all
52 contractors on the project site including but not limited to the following:
53 1. Receiving deliveries of materials, products, and equipment.
54 a. Inspect all deliveries upon arrival for damage, completeness, and compliance with the
55 construction documents.
56 i. Deliveries shall remain in original packaging or crates, shipping manifest shall be kept with
57 the delivery and the packaging shall have visible identification of the items within the
58 packaging.

- 1 b. Immediately report any damaged products or equipment to the GC, begin arrangements for
- 2 immediate replacement.
- 3 c. Materials or equipment that have been damaged, are incomplete, or do not comply with the
- 4 construction documents shall not be permitted to be installed.
- 5 2. All materials and products shall be stored within the designated limits of the project site. Only store the
- 6 amount of material necessary for upcoming operations so as not to interfere with other construction
- 7 activities and access to Work by the Owner and Architect. Any offsite storage shall be at the expense of
- 8 the contractor storing the material or product. All offsite storage requirements shall comply with this
- 9 specification. All offsite storage of materials is subject to Owner Representative Quality Management
- 10 review at any time.
- 11 3. Large storage containers may be used but shall be weather tight, securable, placed on concrete blocks,
- 12 timbers, or jack stands and shall be level.
- 13 4. When lifting equipment is required the equipment rating shall be greater than the loading requirements
- 14 of the item being lifted. In addition all of the following shall apply as necessary:
- 15 a. Only designated and/or designed lift points shall be used.
- 16 b. Large items shall have tag lines and handlers at all times during lifting operations.
- 17 c. Lift at multiple points as needed to prevent bending.
- 18 5. Materials and products stored inside of the structure shall comply with all of the following:
- 19 a. Storage shall not be allowed to impede the flow of work in progress.
- 20 b. Storage shall not be allowed to hide completed work from review and inspections.
- 21 c. Storage shall not exceed the design loads of the structural components it is being stored upon.
- 22 6. All materials and products shall be stored according the manufacturers minimum recommended
- 23 requirements. All of the following shall be considered before storing any product or material:
- 24 a. Dust and dirt
- 25 b. Moisture and humidity, including rain and snow
- 26 c. Excessive temperatures, direct sun, etc
- 27 d. Product or material weight and size
- 28 e. Potential for breakage
- 29 f. Product incompatibility with other products such as corrosiveness, chemical reactions,
- 30 flammability, etc.
- 31 g. Product or material value and replacement cost
- 32 7. The Contractor shall be responsible for providing fully functional tarps or plastic wrap, to protect
- 33 materials and products from the weather. All coverings shall be free of large holes and tears, and shall be
- 34 tied, strapped, or weighted down to resist blowing.
- 35 8. The Contractor shall be responsible for any temporary heating, cooling, or other utility requirement that
- 36 may be associated with the storage of a material or product.
- 37 9. The Contractor shall be responsible for securing materials and products of value such as copper, A/V
- 38 equipment, etc. Such items shall be stored in securable shipping containers, job trailers or other such
- 39 storage devices. Container shall be kept secured when not in use.
- 40 B. The GC shall inspect the job site daily to ensure that all products and materials stay weather tight and are
- 41 secured against vandalism or theft as required by this specification.
- 42 C. The Owners Representative may at any time request improvements regarding storage of any material or product
- 43 being provided under these construction documents.
- 44

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR REQUIREMENTS

- 50 A. Designate material storage and handling areas as needed including all of the following:
- 51 1. Designate specific areas of the site for delivery and storage of materials to be used during the execution
- 52 of the Work.
- 53 2. Designated areas shall not be located so as to interfere with the installation of any Work including Work
- 54 by others such as the installation of utilities or the maintenance of existing utilities. This shall include not
- 55 storing items in active utility easements as designated by the site plan.
- 56 B. Arrange for openings in the building as needed to allow delivery and installation of large items. Openings shall
- 57 be appropriately sized to include the use of booms, slings, and other such lifting devices that may be larger than
- 58 the item being installed.

- 1 1. When openings are required in completed Work (new or existing) the GC shall be responsible for
2 providing an appropriate opening and for restoring the opening to the original or better condition upon
3 completion. Restoration shall be weather tight and complete.
- 4 C. Repeated moving and handling of items being stored shall not be allowed. The GC shall be responsible for any
5 damage and replacement because of mishandling or excessive handling.
- 6
- 7 **3.2. BULK MATERIAL**
- 8 A. Bulk material such as sand, gravel, top soil and other types of fill shall be stored away from the construction area
9 and shall be stock piled as follows:
- 10 1. All bulk material shall be piled safely and efficiently in as small an area as practical. Only store the
11 amount of material necessary for upcoming operations so as not to interfere with other construction
12 activities and access to Work by the Owner and Architect.
- 13 2. All stock piles shall have silt fence/sock properly installed around the perimeter to prevent erosion and
14 loss of material. Refer to City of Madison Standard Specification Section 210.1(f) and other related
15 specification or details.
- 16 3. Fine grained material shall be protected with tarps to prevent blowing. Tarps shall be weighted or staked
17 to stay in place.
- 18 B. Bulk material such as brick, concrete block, stone, and other palletized materials shall be stored on original
19 shipping pallets until ready for use.
- 20
- 21 **3.3. DRY PACKAGED MATERIAL**
- 22 A. Dry packaged material such as cement, mortar, etc shall be stored on pallets, on slightly elevated ground or clear
23 stone pad to keep water away from the base of the material being stored. Protect from moisture.
- 24
- 25 **3.4. STRUCTURAL AND FRAMING MATERIAL**
- 26 A. All structural and framing material shall be stored in an organized manner arranged by type, size and dimension.
27 Materials shall be stored on pallets or timbers as necessary and shall not be allowed to lie directly on the ground.
- 28 B. Long and heavy items shall be supported at several points to prevent bending and warping.
- 29
- 30 **3.5. EQUIPMENT**
- 31 A. Equipment delivered to the site shall be stored away from all construction activities until the item can either be
32 moved inside or properly installed.
- 33 B. Equipment shall be stored on slightly elevated ground or clear stone pad to keep water away from the base of
34 the equipment.
- 35
- 36 **3.6. FINISH PRODUCTS**
- 37 A. Finish products such as flooring, tile, counters, lockers, toilets, partitions, lighting, and other similar items should
38 not be delivered and stored until the structure has been enclosed, is weather tight, temperature controlled and
39 the contractor is ready for such items to be installed.
- 40 1. Storage of finished products outside for any length of time shall not be allowed.
- 41 B. Products that cannot be stored inside the structure shall be stored in secured containers or job trailers until such
42 time as they are ready to be installed.
- 43 C. Products with a high potential for breakage such as glass, mirrors, tiles, toilet fixtures, etc. shall be stored with
44 additional protection as necessary such as but not limited to the following:
- 45 1. Store in original shipping containers until ready for installation.
- 46 2. Do not store in high traffic areas.
- 47 3. Shield with other materials such as cardboard, plywood, or similar products.
- 48
- 49 **3.7. DUCTWORK, PIPING, AND CONDUIT**
- 50 A. All piping and conduit shall be stored horizontally unless otherwise specified by the manufacturer or Division and
51 Trade Specifications.
- 52 1. Do not store directly on grade.
- 53 2. Cover metal pipes and tubes to prevent rust and corrosion, allow ventilation to prevent condensation.
- 54 3. Whenever possible use pipe stands for storing pipe and conduit to prevent tripping and rolling hazards.
- 55 B. All ductwork shall be stored horizontally or vertically as necessary unless otherwise specified by the
56 manufacturer or Division and Trade Specifications.
- 57 1. During storage, both ends of each duct shall be protected with plastic sheathing to prevent dust and dirt
58 from getting inside the duct. Sheathing shall be sufficiently taped to the duct.

**SECTION 01 73 29
CUTTING AND PATCHING**

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17

PART 1 – GENERAL

1.1. SUMMARY

- 21 A. This Section includes general procedural requirements for cutting and patching including, but not limited to the
22 following:
23 1. Examination
24 2. Preparation
25 3. Performance
26 4. Cleanup and Restoration
27

1.2. RELATED SPECIFICATION SECTIONS

- 29 A. Divisions 02 through 32 Sections for specific requirements and limitations applicable to cutting and patching
30 individual parts of the Work.
31 B. Division 07 Section "Penetration Fire Stopping" for patching fire-rated construction.
32

1.3. DEFINITIONS

- 34 A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
35 B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other
36 Work.
37 C. Level Alpha
38

1.4. QUALITY ASSURANCE

- 40 A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying
41 capacity or load-deflection ratio.
42 B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results
43 in reducing their capacity to perform as intended or that may result in increased maintenance or decreased
44 operational life or safety.
45 C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that
46 could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that
47 may result in increased maintenance or decreased operational life or safety. Some miscellaneous elements
48 include the following:
49 1. Water, moisture, or vapor barriers
50 2. Membranes and flashings
51 3. Exterior curtain-wall construction
52 4. Equipment supports
53 5. Piping, ductwork, vessels, and equipment
54 6. Noise and vibration control elements and systems
55 D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and
56 patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that
57 would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has
58 been cut and patched in a visually unsatisfactory manner.

1 **1.5. WARRANTY**

- 2 A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting
3 and patching operations, by methods and with materials so as not to void existing warranties.
4 B. All cutting and patching work performed under this contract shall be warranted like new work as defined by the
5 Specification governing the work.
6

7 **PART 2 - MATERIALS**

8
9 **2.1. GENERAL**

- 10 A. Comply with requirements specified within other sections of the Specifications.
11 B. In-Place Materials: Use materials identical to existing in-place materials. For exposed surfaces use materials that
12 visually match in-place adjacent surfaces to the fullest extent possible.
13 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the
14 visual and functional performance of in-place materials.
15

16 **PART 3 - EXECUTION**

17
18 **3.1. EXAMINATION**

- 19 A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
20 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including
21 compatibility with in-place finishes or primers.
22 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
23

24 **3.2. PREPARATION**

- 25 A. Temporary Support: Provide temporary support of Work to be cut.
26 B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection
27 from adverse weather conditions for portions of Project that might be exposed during cutting and patching
28 operations.
29 C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
30 D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be
31 removed, relocated, or abandoned, bypass such services/systems before cutting to eliminate interruption to
32 occupied areas.
33

34 **3.3. PERFORMANCE**

- 35 A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the
36 earliest feasible time, and complete without delay.
37 1. Cut in-place construction to provide for installation of other components or performance of other
38 construction, and subsequently patch as required to restore surfaces to their original condition.
39 B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations,
40 including excavation, using methods least likely to damage elements retained or adjoining construction. If
41 possible, review proposed procedures with original Installer; comply with original Installer's written
42 recommendations.
43 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and
44 chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance
45 of adjacent surfaces. Temporarily cover openings when not in use.
46 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
47 3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
48 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by
49 cutting and patching operations.
50 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap,
51 valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other
52 foreign matter after cutting.
53 6. Proceed with patching after construction operations requiring cutting are complete.
54 C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following
55 performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and
56 comply with installation requirements specified in other Sections.
57 D. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of
58 installation.

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3.4. CLEANUP AND RESTORATION

- A. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - 1. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - 2. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 5. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.
 - 7. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

**SECTION 01 74 13
PROGRESS CLEANING**

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16

PART 1 – GENERAL

1.1. SUMMARY

- 20 A. Throughout the execution of this contract all contractors shall be responsible for maintaining the project site in a
21 standard of cleanliness as described in this specification.
22 B. All contractors shall also comply with the requirements for cleaning as described in other specifications.
23 C. Work included in this specification shall include but not be limited to:
24 1. Safety Cleaning
25 2. Project Site Cleaning
26 3. Progress Cleaning
27 4. Final Cleaning
28

1.2. RELATED SPECIFICAITONS

- 30 A. Section 01 35 00 Special Procedures
31 B. Section 01 60 00 Product Requirements
32 C. Section 01 74 19 Construction Waste Management and Disposal
33 D. Section 01 76 00 Protecting Installed Construction
34

1.3. QUALITY ASSURANCE

- 36 A. The General Contractor (GC) shall conduct daily inspections, more often if necessary, of the entire project site to
37 ensure the requirements of cleanliness are being met as described within these specifications.
38 B. All contractors shall comply with other regulatory requirements as they apply to waste recycling, reuse, hauling,
39 and disposal requirements of any governmental authority having jurisdiction.
40 C. The Owner reserves the right to have work done by others in the event any contractor fails to perform cleaning
41 as described within these specifications. The cost of any Owner provided cleaning shall be charged to the
42 contractor through a deduct change order.
43

PART 2 - PRODUCTS

2.1. CLEANING MATERIALS AND EQUIPMENT

- 47 A. The Contractor shall provide all required personnel, equipment, and materials necessary to maintain the
48 required level of cleanliness as described in this specification.
49 B. Use only cleaning materials and equipment that are compatible with the surface being cleaned, as
50 recommended by the manufacturer, or as approved by the A/E.
51 C. Use only cleaning materials, equipment, and methods as recommended in the manufacturers care and use guide
52 of the material, finish or equipment being cleaned.
53

PART 3 - EXECUTION

3.1. SAFETY CLEANING

- 57 A. All Contractors shall be responsible for safety cleaning as required by OSHA and other regulatory requirements
58 as applicable.

- 1 B. Safety Cleaning shall include but not be limited to the following:
2 1. All work areas, passageways, ramps, and stairs shall be kept free of debris, scrap materials, pallets, and
3 other large items that would obstruct exiting routes. Small items such as tools, electrical cords, etc are
4 picked up when not in use.
5 2. Form and scrap lumber shall have nails/screws removed or bent over. Lumber shall be neatly stacked in
6 an area designated by the GC.
7 3. Spills of oil, grease, and other such liquids shall be cleaned immediately or sprinkled with sand/oil-dry
8 first, then cleaned.
9 4. Oily, flammable, or hazardous items shall be stored in appropriate covered containers and storage
10 devices unless actively being used.
11 5. Oily, or flammable rags, and other such waste shall only be disposed of in authorized covered containers.
12 6. Disposal by burning shall not be allowed at any time.

13
14 **3.2. PROJECT SITE CLEANING**

- 15 A. This section applies to the general cleanliness of the project site as a whole for the duration of the execution of
16 this contract.
17 B. Exterior Project Site Areas
18 1. The GC and other Contractors as appropriate shall ensure the following levels of cleanliness are applied
19 to the exterior project site areas.
20 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
21 material waste, job trailers, and the project area are clean and well maintained.
22 b. The construction fence is maintained, erect with no gaps, and properly posted per all regulatory
23 requirements.
24 c. All erosion control measures are properly maintained, cleaned, and repaired as necessary.
25 d. All loose materials (construction or waste) are properly tied or weighted down to resist blowing.
26 e. All construction materials are properly covered with fully functional tarps or plastic wrap,
27 protected from the weather, coverings are tied, strapped, or weighted down to resist blowing.
28 f. Dust control is applied as necessary or as required by any regulatory requirement.
29 C. Interior Project Site Areas
30 1. All Contractors shall ensure the following levels of cleanliness are applied to the interior project site
31 areas.
32 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
33 material waste, and project area are clean and well maintained.
34 b. Stored materials are kept in original shipping containers whenever possible. Stored materials not
35 in shipping containers are properly stored and protected according to other applicable
36 specifications.
37 c. All scraps and debris shall be properly disposed of as often as necessary to keep work areas,
38 passageways, stairs, and ramps free of debris and clear for emergency exiting.
39 d. Boxes, pallets, and other such shipping containers, are broken down, stored in a consolidated area
40 or, disposed of as often as is necessary.
41 e. Hand tools, supplies, materials, electrical cords not being used are picked up and stored in gang
42 boxes, not left as walking hazards in work areas, passageways, etc.
43 D. Job Trailer
44 1. The interior of the job trailer shall be kept clean and available as a work space at all times. The GC shall
45 ensure that the following is provided for within the job trailer:
46 a. Meeting space including tables and chairs.
47 b. Sufficient space for all contractors to access the official construction documents, provide updates,
48 etc.
49

50 **3.3. PROGRESS CLEANING**

- 51 A. This sub-section shall apply to all Progress Cleaning prior to the installation of finishes, fixtures, and trim (IE
52 rough-in).
53 1. For the purposes of this section "clean" shall be defined as a level of cleanliness free of dust and other
54 material capable of being removed by use of reasonable effort using a good quality janitor broom and
55 shop-vac.
56 2. Daily cleanings shall be conducted by all contractors at the end of the work day as follows:
57 a. Debris in excavated areas shall be removed prior to backfill and compaction.
58 b. Debris in wall cavities, chase spaces, etc shall be removed prior to enclosing the spaces.

- 1 c. Large items shall be properly stored, returned to designated areas, or disposed of as necessary.
2 d. Loose materials shall be properly secured.
3 e. Flammable or hazardous materials are properly stored or disposed of.
4 3. Weekly cleaning shall be conducted by all contractors as designated by the GC. Weekly cleanings shall
5 include all the above for a daily cleaning and other necessary cleaning as designated by the GC.
6 B. This sub-section shall apply to Progress Cleaning in preparation for the installation of finishes, fixtures, and trim.
7 a. Surfaces receiving finishes shall be thoroughly cleaned prior to contractors applying finish
8 materials. The GC shall be responsible for inspecting the area and surfaces being cleaned for
9 finish prior to the sub-contractor applying the finish. This shall include but not be limited to the
10 following:
11 i. Wall surfaces shall be wiped clean of dirt and oily residues, vacuumed free of dust, and
12 shall be free of surface imperfections prior to painting or installing wall coverings.
13 ii. Metal surfaces shall be wiped clean of dirt and oily residues, and be free of surface
14 imperfections prior to painting.
15 iii. Flooring shall be broom swept of large and loose items then vacuumed clean of dust and
16 small particles, and damp mopped clean and dried prior to installing any flooring finish.
17 Additional cleaning may be required depending on the preparation requirements
18 recommended by the flooring material manufacturer.
19 C. This sub-section shall apply to Progress Cleaning after the installation of finishes, fixtures, and trim.
20 1. For the purposes of this section "clean" shall be defined as a level of cleanliness free of dust and other
21 material capable of damaging or visually disfiguring finished work, finishes, fixtures, and trim.
22 2. Progress Cleaning at this point in the contract shall be conducted immediately as follows:
23 a. Dust, dirt, etc shall be swept and vacuumed off of finish flooring and trim.
24 b. Liquid spills shall be cleaned up according to the spill type. This shall include drips and spills
25 caused by paint, stain, sealants, and other such items.
26 3. The Contractor(s) at no additional cost to the Owner shall be responsible for replacing any finished work,
27 finishes, fixtures, and trim damaged or disfigured because of inadequate or improper cleaning.
28

29 3.4. FINAL CLEANING

- 30 A. As noted in Specification 01 29 76 Progress Payment Procedures, Progress Payment Milestone Schedule, Final
31 Cleaning shall not be conducted prior to requesting the 90% contract total progress payment and all of the
32 following shall be complete:
33 1. All final regulatory inspections including but not limited to Building Inspection Department and Madison
34 Fire Department inspections have been successfully completed.
35 2. All Quality Management Observation (QMO) reports have been closed out.
36 3. All Demonstration and Training has been completed.
37 4. All Attic Stock has been consolidated and located to its designated area
38 5. All protection for installed construction shall be removed prior to final cleaning by the contractor
39 responsible for providing the protections. This shall include the removal of any adhesive residues left
40 behind from tapes. Contractors shall only use manufacturer authorized cleaning materials for removing
41 adhesives, etc.
42 B. For the purposes of this section "clean" shall be defined as a level of cleanliness generally provided by skilled
43 cleaners using commercial quality building maintenance equipment and materials.
44 C. The GC shall be responsible for ensuring that all requirements under this section are being met.
45 D. General Requirements
46 1. Employ experienced personnel or professional cleaners for final cleaning as necessary for the areas or
47 equipment being cleaned.
48 2. Cleaning equipment used shall be commercial grade equipment commonly used by professional cleaners.
49 3. Cleaning equipment and materials shall be cleaned, rinsed, or replaced to ensure a uniform level of
50 cleanliness is being maintained during the final cleaning. This shall include but not be limited to the
51 following:
52 a. Vacuum cleaner bags and/or filters are changed and/or cleaned as often as necessary.
53 b. Dust & wipe down rags are washed, rinsed, or replaced before starting each room.
54 c. Mopping equipment
55 i. Mop water for washing shall have cleaning solution added to the amount and temperature
56 per manufacturer's recommendations. Mop washing water shall be replaced often to
57 maintain the levels of the cleaning solution and temperature required.
58 ii. Mop water for rinsing shall remain clean, clear, and be replaced as often as necessary.

**SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

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20

PART 1 – GENERAL

1.1. SUMMARY

- 24 A. This specification includes administrative and procedural requirements for the recycling, re-use, salvaging, and
25 disposal of non-hazardous construction and demolition waste.
26 B. The General Contractor (GC) shall be fully responsible for complying with all applicable ordinances and other
27 such regulatory requirements during the execution of this contract.
28

1.2. RELATED SPECIFICAITONS

- 30 A. 01 29 76 Progress Payment Procedures
31 B. 01 31 23 Project Management Web site
32 C. 01 32 19 Submittals Schedule
33 D. 01 33 23 Submittals
34 E. 01 77 00 Closeout Procedures
35 F. Other Divisions and Specifications that may address the proper disposal of construction or demolition waste as it
36 pertains to work being conducted under that particular specification.
37

1.3. CITY ORDINANCES

- 39 A. There are two (2) Madison General Ordinances (MGO) that the City of Madison has regarding construction and
40 demolition waste.
41 1. MGO 10.185, Recycling and Reuse of Construction and Demolition Debris, describes the requirements
42 associated with this ordinance including definitions, documentation requirements, and penalties.
43 2. MGO 28.185, Approval of Demolition (Razing, Wrecking) and Removal, describes the requirements
44 associated with applying for and receiving a demolition permit.
45 B. All City of Madison, Board of Public Works, contracts being conducted by City Engineering, Facility Management,
46 for construction, remodeling, or demolition shall comply with the above ordinances regardless of project type or
47 size.
48

1.4. DEFINITIONS

- 50 A. Clean: Untreated and unpainted material, free of contamination caused by oils, solvents, caulks, and other
51 chemicals.
52 B. Construction and Demolition Debris: Materials resulting from the construction, remodeling, repair, and
53 demolition of utilities, structures, buildings, and roads.
54 C. Disposal: Off-site removal of construction and demolition debris and the subsequent sale, recycling, reuse, or
55 deposit in authorized landfill or incinerator.
56 D. Hazardous: Exhibiting the characteristics of hazardous substance, i.e. ignitability, corrosiveness, toxicity, or
57 reactivity and including but not limited to asbestos containing materials, lead, mercury and PCBs.
58 E. Non-hazardous: Exhibiting none of the characteristics of a hazardous substance.

- 1 F. Nontoxic: Not immediately poisonous to humans or poisonous after a long period of exposure.
- 2 G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured
- 3 into a new product.
- 4 H. Recycle: Any process by which construction or demolition debris is diverted from final disposal as solid waste at
- 5 a permitted landfill and instead is collected, separated, and/or processed into raw materials for new, reused, or
- 6 reconstituted products; or for the recovery of materials for energy production processes.
- 7 I. Recycler: Any recycling facility, transfer station, or other waste handling facility which accepts construction and
- 8 demolition debris for recycling, or for other transferring to a recycling facility.
- 9 J. Recycling: The process of sorting, cleaning, treating, or reconstituting solid waste and other discarded materials
- 10 for the purpose of preparing the material to be recyclable. Recycling does not include burning, incinerating or
- 11 thermally destroying waste.
- 12 K. Return: To give back reusable items or unused products to vendors for credit.
- 13 L. Reuse: Shall mean any of the following:
- 14 1. The on-site use of reprocessed construction and demolitions debris.
- 15 2. The off-site redistribution of a material, for use in the same manner or similar manner at another
- 16 location.
- 17 3. The use of non-toxic, clean wood as an alternative fuel source.
- 18 M. Salvage: To remove a waste material from the project site for resale or reuse by the Owner or others.
- 19 N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- 20 O. Trash: Any product or material unable to be re-used, returned, recycled, or salvaged.
- 21 P. Waste: Extra materials or products that have reached the end of its useful life or its intended use. Waste
- 22 includes salvageable, returnable, recyclable and re-useable construction and demolition materials, and trash.
- 23

24 **1.5. PERFORMANCE REQUIREMENTS**

- 25 A. The GC shall develop a Waste Management Plan that results in end-of-project rates for salvage/recycling/reuse
- 26 of 75 percent (minimum) by weight of the total waste generated by the Work. Percentages may be adjusted on
- 27 a project by project basis depending on selected LEED goals associated with the project.
- 28 B. The GC shall salvage or recycle 100 percent of all uncontaminated packaging materials including but not limited
- 29 to the following:
- 30 1. Paper
- 31 2. Cardboard
- 32 3. Beverage containers
- 33 4. Boxes
- 34 5. Plastic Sheet and film
- 35 6. Polystyrene packaging
- 36 7. Wood crates and pallets
- 37 8. Plastic pails and buckets
- 38 C. Promote a resourceful use of supplies and materials through proper planning and handling. Generate the least
- 39 amount of waste possible by minimizing errors, poor planning, breakage, mishandling, contamination or other
- 40 similar factors.
- 41 D. Use all reasonable means to divert construction waste from landfills and incinerators through recycling, reuse, or
- 42 salvage as appropriate.
- 43

44 **1.6. SUBMITTALS AND DELIVERABLES**

- 45 A. The GC shall provide his/her completed Waste Management Plan to the Project Management Web Site as a
- 46 submittal for review by the Project Architect and City Project Manager.
- 47 1. See item 1.8 below for Waste Management Plan submittal requirements.
- 48 2. The Waste Management Plan shall be completed, submitted, and approved as a pre-requisite for
- 49 Progress Payment number 1.
- 50 3. Copies of all documentation required by this specification shall be submitted to the appropriate Project
- 51 Management Web Site Library. Documentation shall be reviewed by the City Project Manager during all
- 52 Progress Payment reviews for compliance and accuracy.
- 53 B. The Waste Management Coordinator shall provide copies of items 1 through 5 below to the appropriate Project
- 54 Management Web Site Library and shall update the Waste Management Summary Log to reflect the records
- 55 being submitted.
- 56 1. Records of Donations: Indicate receipt and acceptance of itemized salvageable waste donated to
- 57 individuals or organizations. Indicate if the organization is tax exempt.

- 1 2. Records of Sales: Indicate receipt and acceptance of itemized salvageable waste sold to individuals or
2 organizations. Indicate if the organization is tax exempt.
- 3 3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by
4 recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts and
5 invoices.
- 6 4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and
7 incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
- 8 5. Statement of Refrigerant Recovery: The Refrigerant Recovery Technician responsible for recovering
9 refrigerant shall provide the GC with a statement indicating all of the following:
10 a. All recovery was performed according to EPA Regulations.
11 b. All refrigerant present was recovered; indicate the total quantity recovered by unit.
12 c. Date of Recovery.
13 d. Name, address, company name, and phone number of technician performing the recovery.
14 e. Technician shall sign and date the statement.
- 15 C. LEED Submittal: The GC shall provide the following information using the appropriate LEED letter template upon
16 project completion: indicating that the requirements of the credit have been met. *NOTE: This requirement shall*
17 *only apply to projects having a LEED certification goal.*
18 1. Total waste material generated.
19 2. Total waste material diverted by diversion method; recycling, salvage, re-use, etc.
20 3. Statement that the credit requirements have been met.
21 4. GC shall sign the letter.

22 23 **1.7. QUALITY ASSURANCE**

- 24 A. Waste Management Coordinator: The GC shall be responsible for designating a Waste Management
25 Coordinator. Coordinator may be the GC Supervisor, GC Project Manager or other member of the GC staff
26 having knowledge of proper waste management procedures and all applicable regulations.
- 27 B. Regulatory Requirements: comply with all hauling and disposal regulations of authorities having jurisdiction.
- 28 C. The Waste Management Coordinator shall comply with Specification 01 31 19 Project Meetings, Section 3.7.B.1
29 and conduct a Waste Management Conference at the job site. This conference shall be repeated as necessary as
30 additional trades are added to the Work. The conference shall include but not be limited to the following:
31 1. Identify the Waste Management Coordinator; provide trade contractors with name, phone, and email
32 information.
33 2. Review and discuss the Waste Management Plan and the roles of the Coordinator.
34 3. Review the requirements for documenting and reporting procedures of each type of waste and its
35 disposition.
36 4. Review procedures for material separation; indicate availability and locations of containers and bins.
37 5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
38 6. Review waste management procedures specific to each trade.
- 39 D. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

40 41 **1.8. WASTE MANAGEMENT PLAN**

- 42 A. Develop a plan consisting of waste identification, a waste reduction work plan, and cost/revenue analysis.
43 Indicate quantities by weight or volume. Use the same units of measure throughout the waste management
44 plan.
45 1. Waste Identification: Indicate anticipated types and quantities of site clearing, demolition waste, and
46 construction waste that will be generated during the execution of this contract. Include assumptions for
47 the estimates.
- 48 2. Waste Reduction Work Plan: The work plan shall consist of but not be limited to all of the following:
49 a. Identify methods for reducing construction waste. Re-using, framing and forming materials, re-
50 planning material cuts to minimize waste, etc.
51 b. Identify what types of materials will be recycled. Provide lists of local companies that receive
52 and/or process the materials. Include names, addresses, and phone numbers.
53 c. Identify what types of materials will be disposed of and whether it will be disposed of in a landfill
54 facility or by incineration facility. Provide lists of local companies that receive and/or process the
55 materials. Include names, addresses, and phone numbers.
56 d. Identify methods to be used on site for separating waste including all of the following:
57 i. Sizes of containers to be used.
58 ii. Labels to be used on the containers to identify the type of waste allowed in the container.

- 1 2. Inspect containers and bins frequently for contamination and inappropriately sorted materials. Remove
- 2 contaminated materials and resort as necessary.
- 3 3. Stockpile bulk materials such as sand, topsoil, stone, etc., on site away from the construction area and
- 4 without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water, and
- 5 cover to prevent windblown dust. Do not store within the drip lines of existing trees.
- 6 4. Whenever possible store items off the ground and/or protect them from the weather.
- 7

8 **3.4. GUIDELINES FOR RECYCLABLE, RE-USABLE, AND SALVAGEABLE WASTE**

- 9 A. The following guidelines is not a complete or all inclusive list and shall be adjusted as needed by the methods
- 10 and procedures identified in the Waste Management Plan.
- 11 B. Asphalt Paving: Break-up into transportable pieces or grind, transport to an authorized recycling facility.
- 12 C. Carpet and Pad: Separate carpet and pad scraps, containerize and transport to an authorized recycling facility.
- 13 D. Ceiling System Components: Suspended ceiling system components shall be sorted by material type as follows:
- 14 1. Broken, cut, or damaged tiles shall be containerized, transport to an authorized recycling facility.
- 15 2. Damaged, or cut tracks, trim and other metal grid system components shall be sorted with other metals
- 16 of similar types, palletize, transport to an authorized recycling facility.
- 17 E. Clean Fill: When allowed by Division 31 Specifications; concrete, masonry, stone, asphalt pavement, sand and
- 18 other such materials may be used as clean fill on this project site. The GC shall verify with the Project Architect,
- 19 Structural Engineer, or Civil Engineer as necessary prior to using any materials as clean fill. Materials shall be
- 20 processed, placed, and compacted as specified. If not being re-used on site, transport to an authorized recycling
- 21 facility.
- 22 F. Clean Wood Materials: Including but not limited framing cutoffs, wood sheathing or paneling materials,
- 23 structural or engineered wood products, and pallets or crates. Clean Wood shall be free of paints, stains, oils,
- 24 preservatives and other such contaminants.
- 25 1. Useable pieces shall be sorted by type and dimension, bundled and transported off site by the GC or
- 26 returned to the supplier.
- 27 2. Non-useable pieces shall be palletized or containerized, transport to an authorized recycling facility.
- 28 3. Clean, uncontaminated sawdust and wood shavings shall be bagged, transport to an authorized recycling
- 29 facility.
- 30 G. Concrete: Break-up into transportable pieces, remove all reinforcing and other metals, transport to an
- 31 authorized recycling facility.
- 32 H. Glass Products: Shall be sorted by types, do not include light fixture lamps and bulbs. Products broken in
- 33 shipment shall be returned to the supplier. Broken or cracked items still in frames shall be taped to prevent
- 34 further breakage and injury to workers. Transport to an authorized recycling facility.
- 35 I. Gypsum Board: Stack large clean pieces on wooden pallets or container, store in a dry location, transport to an
- 36 authorized recycling facility.
- 37 J. Light Fixture Lamps and Bulbs: Fluorescent tubes shall be containerized, transport to an authorized recycling
- 38 facility.
- 39 K. Masonry and CMU: Remove all metal reinforcing, anchors, and ties, clean undamaged pieces and neatly stack on
- 40 pallets, transport damaged pieces to an authorized recycling facility.
- 41 L. Metals: Sort metals by type as follows, this does not include piping:
- 42 1. Architectural metals including but not limited to siding, soffit, and roofing panels shall be sorted by
- 43 material, palletize or bundle as needed and transport to an authorized recycling facility.
- 44 2. Structural steel, sort by size and type; palletize and transport to an authorized recycling facility.
- 45 3. Miscellaneous metals such as aluminum, brass, bronze, etc shall be sorted by type, containerized or
- 46 palletized as necessary, transport to an authorized recycling facility.
- 47 M. Packaging and shipping materials
- 48 1. Cardboard boxes and containers: Breakdown all cardboard boxes and containers into flat sheets. Bundle
- 49 and store in a dry location until transported for recycling.
- 50 2. Pallets:
- 51 a. Whenever possible require deliveries using pallets to remove them from the project site.
- 52 b. Neatly stack pallets in preparation for reusing them or providing them to other companies for
- 53 salvage or re-use.
- 54 c. Break down pallets into component wood pieces that comply with the requirements for recycling
- 55 clean wood materials. Neatly stack or palletize pieces in preparation for transportation.
- 56 3. Crates: Break down crates into component wood pieces that comply with the requirements for recycling
- 57 clean wood materials. Neatly stack or palletize pieces in preparation for transportation.
- 58 4. Polystyrene Packaging: Separate and bag materials.

- 1 N. Piping and conduit: Reduce all piping and conduit to straight lengths, sort and store by size, material and type.
2 Remove supports, hangers, valves, boxes, sprinkler heads, and other such components, sort and store by size,
3 material and type. Transport to authorized recycling facilities according to material types.
4 O. Roofing: Roofing materials shall be sorted and containerized by type, transport to authorized recycling facilities
5 according to material types.
6 P. Site-Clearing Waste: Sort all site waste by type.
7 1. Only stockpile soils types and quantities required for re-use on the project site. All remaining quantities
8 shall be transported off site to an authorized facility that receives such materials.
9 2. Brush, branches, and trees with no marketable re-use shall be transported to facilities for chipping into
10 mulch.
11 3. Trees with a marketable re-use shall be salvaged and transported to facilities that specialize in processing
12 trees for future use as wood products.
13

14 **3.5. GUIDELINES FOR DISPOSAL OF WASTES**

- 15 A. The following guidelines shall be adjusted as needed by the methods and procedures identified in the Waste
16 Management Plan.
17 B. Any waste that is contaminated, organic, or cannot be recycled, re-used, or salvaged shall be legally disposed of
18 in an authorized landfill or incinerator. Disposal methods shall follow all applicable regulatory requirements.
19 C. No waste material of any kind, except those types designated as clean fill in section 3.4 above, shall be allowed
20 to be buried on the project site at any time.
21 D. No burning of any kind of waste material shall be permitted on this project site at any time.
22 E. Paint and Stain: Paints, stains, and their containers shall be disposed of as follows:
23 1. Whenever possible containers should be thoroughly cleaned immediately after emptying and sorted with
24 as appropriate (metal or plastic) for recycling
25 2. Empty containers, regardless of type or base material, may be disposed of with lids off with general
26 garbage.
27 3. Latex paint may be placed with general garbage if properly solidified as follows:
28 a. Small amounts (an inch or less in can): Remove lids and allow paint to dry out in the can and
29 harden. Protect cans from rain and freezing.
30 b. Large amounts (more than one inch): Mix paint with equal amounts of cat litter, stir and allow to
31 completely dry. Alternate method: mix with commercial paint hardener.
32 4. Oil-based or combustible paints and stains, regardless of liquid or solid, shall be transported to an
33 approved facility that takes such items such as Dane County Clean Sweep Sites.
34 F. Treated Wood Materials: Treated wood materials including but not limited to wood that has been painted,
35 stained, or chemically treated shall not be recycled or incinerated.
36
37
38
39

END OF SECTION

SECTION 01 76 00
PROTECTING INSTALLED CONSTRUCTION

1
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PART 1 – GENERAL

1.1. SUMMARY

- 25 A. The purpose of this specification is to provide clear responsibilities, guide lines, and requirements related to
26 providing protection to already installed construction.
27 B. Already installed construction shall include but not be limited to the following:
28 1. Any existing site feature such as pavement, curbs, drainage features, utilities, landscaping features (trees,
29 shrubbery, plantings, flagpoles, etc) and other such exterior items not associated with the building
30 whether on or adjacent to the project site.
31 2. Any existing structure on or adjacent to the project site.
32 3. Any existing interior work that may be adjacent to the new work including all paths of ingress/egress to
33 areas associated with accessing the Work.
34 4. Any existing feature of any kind within the public right-of-way that may be on the project site property,
35 adjacent to the project site or across the street from the project site.
36 C. All contractors shall be familiar with the specifications of their Division of Work for specific requirements on
37 protection of the Work.
38 D. The requirements noted within this specification do not relieve any contractor of the responsibility for
39 compliance with any code, statute, ordinance, or other such regulatory requirement having jurisdictional
40 authority over these contract documents.

1.2. QUALITY ASSURANCE

- 43 A. It shall be the responsibility of every contractor and worker assigned to the project to be diligent in protecting all
44 existing work, and newly installed construction.
45 B. It shall be the General Contractors' (GC) responsibility under the contract to provide all reasonable protection
46 methods, materials, or precautionary measures required to protect new or existing construction as described in
47 within this specification to the project as a whole.
48 1. The GC shall be responsible to ensure any damaged new or existing construction is repaired or replaced
49 at no additional cost to the Contract.
50 2. The GC at his/her discretion may direct other contractors to provide and maintain protection of
51 completed work associated with their Division of Work. I.E.: The carpet installer may be required by the
52 GC to provide carpet protection along traveled paths, ingress/egress, etc after installation.
53 C. It shall be the responsibility of the GC to ensure that all materials being used to protect installed construction are
54 compatible with, and/or adjacent to, the materials being protected. This shall include but not be limited to the
55 material used as covering, tapes used to fasten protective materials, etc.

1
2 **1.3. RELATED SPECIFICATIONS**

- 3 A. Parts of this specification will reference articles within “The City of Madison Standard Specifications for Public
4 Works Construction”.
- 5 1. Use the following link to access the Standard Specifications web page:
6 <http://www.cityofmadison.com/business/pw/specs.cfm>
- 7 a. Click on the “Part” chapter identified in the specification text. For example if the specification
8 says “Refer to City of Madison Standard Specification 210.2” click the link for Part II, the Part II
9 PDF will open.
- 10 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
11 to the referenced text.
- 12 c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.
- 13 B. Section 01 60 00 Product Requirements
- 14 C. Section 01 74 13 Progress Cleaning

15
16 **PART 2 - PRODUCTS**

17
18 **2.1. FENCING MATERIALS AND BARRICADES**

- 19 A. Except where noted in other areas of the construction documents the responsible contractor may provide any of
20 the following that sufficiently provide a sturdy physical barrier and/or visual barrier as necessary for the
21 intended application.
- 22 1. Standard orange construction barrels each with a standard rubber base ring and reflective tape
23 a. Provide flashing amber lights as needed to increase night time visibility
- 24 2. Steel “T” style fence posts
- 25 3. 4’0” high standard orange construction fence
- 26 4. Traffic barricades
- 27 5. Jersey barriers
- 28 6. Other types of fencing or barricades typically used in the construction industry
- 29 B. The contractor responsible for providing the fencing materials and barricades shall also be responsible for
30 maintaining them. This shall include but not limited to fixing damaged fencing, standing up barrels that have
31 been knocked over, realigning barrels, and ensuring flashing lights are fully operational at all times.
- 32 C. The following fencing and barricade designations, and their use descriptions shall be used throughout this
33 specification to provide uniformity in describing protection requirements.
- 34 1. Type A, Jersey Barriers, to be used as permanent blocking devices to deny access to alternate project site
35 entrances or exits.
- 36 2. Type B, Traffic Barricades, to be used as temporary blocking devices to deny access to alternate project
37 site entrances or exits.
- 38 3. Type C, Construction Barrels without construction fencing shall be used for lane closures, temporary
39 blocking devices to deny access and the protection of single locations (I.E. identify the location of an
40 access structure) that do not require fencing.
- 41 4. Type D, Construction Barrels with construction fencing where it becomes necessary to surround an object
42 with a complete visual barricade and it is impractical or unacceptable to install fence posts. The surround
43 shall be constructed in such a manner as to provide a buffer zone around and access to the item being
44 protected.
- 45 5. Type E, Steel “T” Fence Posts with construction fencing to surround an object with a complete visual
46 barricade and it is practical to install fence posts. The surround shall be constructed in such a manner as
47 to provide a buffer zone around and access to the item being protected.
- 48 6. Type X, Other fencing or barricade types that may be designated and detailed within the construction
49 documents shall use additional alpha numeric designations.

50
51 **2.2. EROSION CONTROL PROTECTION**

- 52 A. Refer to City of Madison Standard Specification 210.2 for authorized materials associated with erosion control
53 materials.

54
55 **2.3. INTERIOR FINISH PROTECTION MATERIALS**

- 56 A. Except where noted in other areas of the construction documents or this specification the responsible
57 contractor:
- 58 1. Shall not provide the cheapest or least effective method as an effort to meet any protection requirement.

- 1 2. Shall provide materials of sufficient quality, and durability to provide adequate protection based on the
2 seasonal conditions and the anticipated duration at the time the protection will be needed.
3 3. Shall provide sufficient quantity of protection material to protect the construction as needed.
4 B. Prior to installing protective measures the responsible contractor shall propose to the GC, Project Architect (PA)
5 and City Project Manager (CPM) the proposed plan for protection, materials to be used and samples as
6 necessary.
7 1. The PA and CPM reserve the right to disapprove any proposed method and/or material and/or make
8 alternate proposals.
9

10 **PART 3 - EXECUTION**

11
12 **3.1. GENERAL EXECUTION REQUIREMENTS**

- 13 A. The GC shall be responsible for ensuring all of the following procedures and requirements are implemented as
14 needed for the duration of the Work performed under this contract.
15 B. The GC shall also be responsible for the following:
16 1. Reporting any incident of damage to existing property, right-of-way, or utility to the CPM immediately
17 upon rendering the incident safe, and notifying emergency response teams, and emergency utility crews
18 as needed.
19 2. Conduct a site walk through prior to leaving at the end of each day to assess:
20 a. Protection measures are properly in place, provide correction actions as necessary.
21 b. Note damage to existing completed work and schedule repair/replacement as needed.
22 3. Ensure all contractors and workers are being diligent in protecting existing work, and newly installed
23 construction.
24

25 **3.2. PROTECT ADJACENT PROPERTIES**

- 26 A. Whenever possible through the design process the City of Madison shall have previously provided notice to
27 adjacent property owners that work will be occurring on or near their property. The City of Madison shall also
28 have obtained any permanent or temporary easements that may be necessary to complete any Work on
29 adjacent properties.
30 B. It shall be the responsibility of the GC to do the following for all Work under this contract being performed on or
31 adjacent to the property line:
32 1. Contact the adjacent property owner and provide him/her with information on the work to be done,
33 equipment to be used, and estimated duration of the work. Information to be updated and
34 communicated to property owner(s) as construction progresses and site conditions change.
35 a. If any adjacent property is a rented or leased space the GC shall also make contact and provide
36 the same information to the tenants.
37 b. Determine from the owner and/or tenants if there are any concerns for children, pets, special
38 plantings, or other concerns.
39 2. Discuss the following with all contractors performing work on or near the property line.
40 a. Work to be completed and timeline.
41 b. Concerns of adjacent property owners/tenants from item 1 above.
42 c. Which protective measures will be necessary to protect adjacent properties and address the
43 concerns of adjacent property owners/tenants.
44 3. Ensure all protective measures are placed and maintained during the execution of Work on or adjacent to
45 the property line. Interact with the adjacent property owners/tenants as needed.
46 C. Any contractor doing work on or adjacent to the property line shall install and maintain any protective measure
47 identified in the contract documents, this specification, or as directed by the GC.
48 D. The GC shall be responsible for restoring any damage to structure and property located on or adjacent to the
49 property line.
50 1. Restoration shall include but not be limited to repair or replacement using like materials and finishes to
51 its original condition or better.
52 2. Restoration of landscaping materials shall include watering of any seed, sod, or other planting of any kind
53 for a reasonable period of time to encourage germination and root development.
54 E. The GC shall keep the CPM informed directly to any issues pertaining to adjacent property owners and tenants.
55

56 **3.3. PROTECT LANDSCAPING FEATURES**

- 57 A. Except where specifically stated in other areas of the construction documents the following minimal protection
58 requirements shall apply under this section.

- 1 1. Whenever possible do not install new landscape features until exterior building construction has been
- 2 completed, equipment such as scaffolding and lifts are no longer needed and have been removed, and
- 3 heavy equipment operation is no longer required.
- 4 2. Whenever possible remove and temporarily store all existing landscape features such as benches, waste
- 5 receptacles, signage, and other such features that will be within the area of Work that can be removed.
- 6 3. Landscape features that cannot be removed such as flag poles, light poles, light bollards, etc. shall be
- 7 protected with Type D fencing for areas on pavement or Type E fencing for areas on soil.
- 8 4. Planting beds shall be protected using Type E fencing around the exposed perimeter of the planting bed
- 9 as needed.
- 10 5. The City of Madison Standard Specification 107.13 shall apply to all tree protection in and around the
- 11 project site at all times.
- 12

13 3.4. PROTECT UTILITIES

- 14 A. The contractor shall be responsible for notifying all utilities to determine emergency response procedures and
- 15 protection requirements prior to installing any construction protection.
- 16 1. This includes requesting utility marking through Diggers Hotline.
- 17 a. Call 811 or 1-800-242-8511 to request a public utility locate
- 18 b. For emergency locate call (262) 432-7910 or (877) 500-9592
- 19 2. Contact the Owner and CPM for any available private utility information on the property that may be
- 20 available prior to calling a private utility locating company.
- 21 B. Except where specifically stated in other areas of the construction documents the following minimal protection
- 22 requirements shall apply under this section.
- 23 1. Hydrants, lamp posts, electrical transformers, and other utility pedestals shall be protected with Type D
- 24 fencing for areas on pavement or Type E fencing for areas on soil. Fence posts shall be located so as to
- 25 not be directly over the utility main.
- 26 2. Storm sewer structures in pavement shall have proper inlet protection according to City of Madison
- 27 Standard Specification 210.1(g) and Type C Construction Barrels when necessary.
- 28 3. Storm sewer structures in turf and other landscaped areas shall have proper inlet protection according to
- 29 City of Madison Standard Specification 210.1(g) and Type E fencing for areas on soil.
- 30 4. Stormwater management features such as greenways, retention/detention ponds, bio-filtration ponds
- 31 and other such features shall be properly protected according to the appropriate erosion control
- 32 measure specified on the Erosion Control Plan. See multiple sections of City of Madison Standard
- 33 Specification 210.1
- 34 a. For the protection of hard to see items such as structures, castings, inlets, etc. in grassy areas
- 35 provide Type E fencing for areas on soil.
- 36 c. For the protection of storm water management features having special soils and plants such as
- 37 bio-filtration ponds provide Type E fencing for areas on soil.
- 38 5. Other structures and covers including but not limited to cleanouts, wiring hand holes, valve boxes, access
- 39 structures, grease trap structures, etc shall be protected as follows:
- 40 a. Provide Type E fencing for areas on soil.
- 41 b. When paving operations are complete provide a construction barrel or cone near structures as
- 42 necessary depending on required heavy construction traffic.
- 43

44 3.5. PROTECT PUBLIC RIGHT OF WAY

- 45 A. Except where specifically stated in other areas of the construction documents the following minimal protection
- 46 requirements shall apply under this section.
- 47 1. All public right-of-way (area from behind the sidewalk to the centerline of the street) shall remain open
- 48 and accessible except during periods of active work. At such times the public right of way shall be
- 49 properly closed and signed as referenced in City of Madison Standard Specification 107.9.
- 50 2. Bus stops and bus stop structures shall remain accessible at all times.
- 51 3. Traffic signage and traffic signals, traffic control boxes shall be protected with Type D fencing for areas on
- 52 pavement or Type E fencing for areas on soil.
- 53 a. Protection at traffic signage/signals shall not obstruct the viewing of the sign/signal for its
- 54 intended purpose at any time.
- 55 B. When additional protection for traffic control is required, the use of barricades, guardrails, lane closures and
- 56 other such procedures will be detailed within the construction documents.
- 57 C. When additional protection for overhead sidewalk cover is required the contract documents shall indicate the
- 58 specific location and structural requirements of the protective structure.

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3.6. PROTECT STORED MATERIALS

- A. All contractors shall refer to Specification 01 60 00 Product Requirements for all storage and protection requirements of building materials and products delivered to the site.

3.7. PROTECT WORK - EXTERIOR

- A. Provide all temporary services that may be required to protect the installed material from heat, cold, humidity, etc, while materials such as concrete, mortar, sealants, paints, etc, are drying and/or curing.
- B. Open trenches, pits, and other such excavations shall be properly covered, lined, or shored as needed during periods of inclement weather to prevent the caving of soils onto existing work in progress. Refer to the appropriate specifications and/or regulatory requirements governing this type of work as necessary.
- C. Provide adequate protection at all openings with heavy duty tarps, plastic sheathing, or wood framing and sheathing as needed to protect interior work in progress from inclement weather as needed.
- D. Protect exterior finishes of all kinds with heavy duty tarps or plastic sheathing as needed while landscaping is being installed through full germination of seeded areas or installation of filter fabric and mulches to keep dust, dirt, and mud off of finished exterior surfaces.
- E. Designate specific curb mounting points and provide wood blocking where small vehicles, skid loaders and other such equipment may need access to areas being landscaped.
- F. Provide plywood turning pads for skid loaders to turn on to prevent tire marking on new pavement.
- G. Do not permit the parking of vehicles with any kind of fluid leaks to park on new pavement.
- H. The contractor shall be responsible for cleaning, repairing, or replacing any completed work or work in progress under this specification as deemed necessary by the CPM without additional cost to the contract.

3.8. PROTECT WORK - INTERIOR

- A. The GC shall do all of the following:
 - 1. Provide all temporary services that may be required to protect the installed material from heat, cold, humidity, etc, while materials such as concrete, mortar, sealants, paints, etc, are drying and/or curing.
 - 2. Provide adequate visual and/or physical protection as needed to protect newly completed interior work such as paint, flooring material, sealants, grouts, etc that may be drying and/or curing.
 - 3. Provide adequate space and materials for cleaning boots, tool boxes, supplies, and other items coming into the project site once finish work has begun.
 - 4. Clean dirtied areas and repair/replace damaged areas immediately.
- B. The contractors responsible for interior work shall be responsible for protecting their work and finishes from dirt, mud, snow, spills, splatters, and physical damage after installation as follows:
 - 1. Protect vinyl composite, rubber composite, painted/stained concrete, and tiled flooring as follows:
 - a. Define foot traffic areas and protect with Ramboard Temporary Floor Protection products as a minimum basis of design or other protection product(s) compatible with installed flooring product if Ramboard is not compatible. Products to be used shall be new.
 - i. Tape all edges, seams, etc with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
 - ii. Repair tears immediately, replace worn areas with like material as necessary.
 - 2. Protect carpeted areas as follows:
 - a. Define foot traffic areas and protect with a minimum of 6mil, clear, polyethylene sheeting 3 feet wide. Products to be used shall be new.
 - i. Tape all edges, seams, etc with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
 - ii. Repair tears immediately, replace worn areas with like materials as necessary.
 - 3. Protect all finished walls in high traffic areas with Ramboard Temporary Wall protection products or approved equal.
 - i. Tape all edges, seams, etc with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
 - ii. Repair tears immediately, replace worn areas with like materials as necessary.
 - 3. Protect counter tops, cabinets, and other finished surfaces with large sheets of thick cardboard or Ramboard products. Do not allow toolboxes, finish materials, parts and other such items to be placed on finished materials.

- 1 C. All protection shall stay in place until the CPM, PA, and GC mutually deem the project is ready for Final Cleaning.
2 The contractors responsible for protecting the work shall be responsible for removing the protection and
3 removing any adhesive residue at that time. Contractors shall only use manufacturer authorized cleaning
4 materials for removing adhesives, etc.
- 5 D. Contractors doing work in un-protected areas of finished work shall be required to provide drop cloths and other
6 protection as noted within this specification for the duration of their work.
- 7 1. Finished areas shall be sufficiently covered to accommodate all equipment, and materials being used to
8 complete the work being done.
- 9 2. Finished areas shall be sufficiently covered to prevent splatters, over spray, etc when doing touch-up
10 work.
- 11 3. Contractors who do not provide sufficient protection under this sub-section shall be responsible for any
12 costs associated with cleaning, repairing or replacing already finished construction at no additional cost
13 to the contract.
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END OF SECTION

**SECTION 01 77 00
CLOSEOUT PROCEDURES**

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PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The purpose of this specification is to clearly define and quantify the requirements associated with closing a City
22 of Madison Public Works Contract for facility related work.
23 B. All contracts have two distinct but related paths. Each path needs to be properly closed independently in order
24 to close the contract as a whole.
25 1. Construction closeout is related to closing out all of the Work associated with the construction
26 documents.
27 a. It shall be the responsibility of all contractors to be fully aware of the required Work and closeout
28 requirements involved in their individual trades.
29 2. Contract closeout is related to closing out all of the administrative aspects of the contract in general.
30 a. It shall be the responsibility of all contractors to be fully aware of the administrative requirements
31 required by the contract and to provide the supporting documentation required.
32 3. Construction Closeout must be completed before Contract Closeout can begin.
33 C. This specification will provide general knowledge associated with the following areas:
34 1. Construction Closeout Requirements
35 2. Construction Closeout Procedure
36 3. Contract Closeout Requirements
37 4. Contract Closeout Procedure
38 5. Final Payment and Certificate of Completion
39

1.2. RELATED SPECIFICATIONS

- 41 A. Contractors shall review all references to other specifications including specifications relating to the execution of
42 the Work associated with their Division or Trade.
43 B. Section 01 29 76 Progress Payment Procedures
44 C. Section 01 31 23 Project Management Web Site
45 D. Section 01 32 26 Construction Progress Reporting
46 E. Section 01 45 16 Field Quality Control Procedures
47 F. Section 01 74 13 Progress Cleaning
48 G. Section 01 45 16 Construction Waste Management and Disposal
49 H. Section 01 76 00 Protecting Installed Construction
50 I. Section 01 78 13 Completion and Correction List
51 J. Section 01 78 23 Operation and Maintenance Data
52 K. Section 01 78 36 Warranties
53 L. Section 01 78 39 As-Built Drawings
54 M. Section 01 78 43 Spare Parts and Extra Materials
55 N. Section 01 79 00 Demonstration and Training
56 O. Other requirements as noted in the contract documents signed by the General Contractor
57

1 **1.3. DEFINITIONS**

- 2 A. **Substantial Compliance:** A letter provided to the City of Madison Building Inspection and signed by the Project
3 Architect indicating that all Work has been completed to a level that would allow Owner Occupancy and that all
4 construction is in compliance with the construction documents. A copy of this letter is also provided to the
5 State of Wisconsin Department of Health and Safety as necessary to clear plan review requirements. This letter
6 does not represent construction closeout.
- 7 B. **Certificate of Occupancy:** The Regulatory letter from the City of Madison Building Inspection Department
8 indicating that all regulatory requirements and inspections have been completed and the building may now be
9 occupied for its intended use. This letter does not represent construction closeout.
- 10 C. **Certificate of Substantial Completion:** A letter provided by the Department of Public Works, signed by the City
11 Engineer indicating that Construction activities are substantially complete. This letter does represent
12 construction closeout and the date of this letter begins the date of the Warranty Period.
- 13 D. **Construction Closeout:** The point in the contract where all contractual requirements associated the execution
14 of the Work as described in the plans, specifications, and other documents have been successfully met and the
15 items described in 1.3.A, .B, and .C above have been completed.
- 16 E. **Final Progress Payment:** The progress payment associated with achieving Construction closeout as described in
17 1.3.D above. At this point the contractor may request all monies associated with the contract be paid with the
18 exception of held retainage.
- 19 F. **Contract Closeout:** The point in the contract where all contractual requirements associated with the City of
20 Madison, Board of Public Works contract has been successfully met.
- 21 G. **Final Payment:** The final contract payment submittal that may be approved by the City of Madison after all
22 contractual requirements of the Public Works Contract have been met and any remaining monies (retainage)
23 due to the contractor may be released for the Final Payment.

24
25 **1.4. QUALITY ASSURANCE – CONSTRUCTION CLOSEOUT**

- 26 A. All contractors shall be responsible for properly executing the construction closeout requirements associated
27 with their Work as described in the specifications governing their Work.
- 28 B. The GC shall be responsible for all of the following:
- 29 1. Ensuring that all contractors have met the construction closeout requirements associated with their
30 Work.
- 31 2. Coordinate the collection of all construction closeout deliverables from all contractors, provide the
32 deliverables to the Project Architect and City Project Manager for review as necessary, and ensure all
33 contractors correct deficiencies of deliverables and resubmit as needed for final acceptance.
- 34 3. Ensure all closeout requirements identified in the Construction Closeout Checklist below have been
35 completed as intended by the construction documents.

36
37 **1.5. QUALITY ASSURANCE – CONTRACT CLOSEOUT**

- 38 A. The City of Madison, Department of Civil Rights (DCR) monitors contract compliance for construction and
39 procurement contracts to ensure that local, state and federal regulations are followed by contractors working on
40 City of Madison Public Works (PW) projects. DCR will monitor all PW projects from contract award through the
41 final payment at the close of the project. Contractors will be required to submit reporting paperwork
42 throughout the PW project process.
- 43 1. Contractors are encouraged to visit the web site identified below for additional information, checklists,
44 forms, and other information provided by DCR as it relates to Contract Compliance.
45 <http://www.cityofmadison.com/Business/PW/contractCompliance.cfm>
- 46 2. Questions regarding the process should be directed to parties and offices as identified on the various
47 forms, documents, and instructions or contact:
48 City of Madison, Department of Civil Rights
49 210 Martin Luther King Jr. Blvd., Room 523
50 Madison, WI 53703
51 (608) 266-4910
- 52 B. All Sub-Contractors have submitted the applicable required documents described in item 1.5.D below to the
53 General Contractor (GC) for Contract Closeout.
- 54 C. The GC has submitted the required applicable documents described in item 1.5.D below for all contractors to the
55 appropriate City of Madison Agency per instructions associated with each submittal.
- 56 D. The documents required for submittal to the City of Madison for Contract Closeout may include any/all of the
57 items listed below depending on contract type. It is the sole responsibility of all contractors to know and submit
58 the required and complete documentation in a timely fashion.

- 1 1. Weekly Payroll Reports
- 2 2. Employee Utilization Reports
- 3 3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
- 4 4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
- 5 5. Documentation required for Small Business Enterprise (SBE) goals
- 6 6. Other documents as maybe required or requested through the Finalization Review Process

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONSTRUCTION CLOSEOUT CHECKLIST

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Construction Closeout Requirements to the GC.
 1. The checklist shall include all items identified within the construction documents that require any of the following (and examples) prior to moving into Contract Closeout Procedures:
 - a. Documents indicating a specified level of performance has been achieved, such as:
 - i. Test reports of all types
 - ii. Startup reports
 - b. Required documentation, such as:
 - i. As-builts and record drawings
 - ii. Operation and maintenance data
 - c. Physical items to be turned over to the owner, such as:
 - i. Attic stock
 - ii. Keys
 - d. Required maintenance completed, such as:
 - i. Ducts cleaned
 - ii. Filters replaced
 - e. Commissioning and LEED related items and submittals
 - f. Owner and Maintenance Training
 - B. Each list shall indicate the title of the closeout requirement, the associated specification of the requirement, the required result or deliverable, the responsible contractor(s), and a column to verify the item has been turned in and completed.
 - C. The GC shall be responsible for all of the following:
 1. Consolidating all the closeout lists into one master Construction Closeout Checklist.
 - a. The checklist shall be in a tabular data format similar to the sample below
 2. Upload the completed checklist to the Contract Closeout-Miscellaneous Documents Library on the Project Management Web Site for review.
 3. Resubmit the checklist as needed after initial reviews have been completed.
 - D. The GC shall work with all contractors to amend the Construction Closeout Checklist throughout the execution of the project based on changes and modifications as necessary.

<u>Title</u>	<u>Specification</u>	<u>Description</u>	<u>Responsibility</u>	<u>Completed</u>
Quality Management Observation Reports	01 45 16	All QMO reports have been properly responded to, reviewed and closed by the CPM.	All, GC	
As-Built Drawings	01 78 39	As-Built drawings have been reviewed and accepted per the specification	All, GC	
Testing and Balancing of HVAC	23 09 23	Provide final TnB reports indicating design performance has been achieved	HVAC	

3.2. CONSTRUCTION CLOSEOUT REQUIREMENTS

- A. The timely submittal or completion of closeout requirements shall go hand in hand with the Progress Payment Milestone Schedule that can be found in Specification 01 29 76 Progress Payments. No payments shall be made until all requirements for that payment have been met.
 1. The GC and all major Subcontractors, PA, and CPM, shall review all requirements for Construction/Contract Closeout during two (2) special meetings.

- 1 a. The first meeting shall be held at the 50% Contract Total Payment milestone. This meeting shall
2 discuss the requirements associated with various construction/contract closeout documentation
3 and events when they are due with respect to progress payments.
4 b. The second meeting shall be held at the 70% Contract Total Payment milestone. This meeting
5 shall review the contractors progress regarding the closeout checklist, begin making plans for
6 upcoming deadlines such as scheduling training, where to put attic stock, and when they are due
7 with respect to progress payments.
8 2. The GC, PA, and CPM, shall utilize the Construction Closeout checklist to ensure that all construction
9 closeout requirements have been met.

10
11 **3.3. CONSTRUCTION CLOSEOUT PROCEDURE**

- 12 A. Upon successful completion and final acceptance of all Construction Closeout Requirements the GC may submit
13 to the CPM and PA the request for Final Progress Payment (100% contract total, less retainage).
14 B. The PA will confirm with the design consultants, CPM, and other City of Madison staff that all requirements of
15 the Work have been completed and will do the following:
16 1. Approve the final progress payment application
17 2. Provide the required signed payment documents to the CPM
18 3. Provide the required Letter of Substantial Compliance to the following as required:
19 a. State Safety and Building Division
20 b. Local Building Inspection office
21 c. GC
22 d. CPM
23 C. The CPM shall draft the City Letter of Substantial Completion for signature by the City Engineer. This letter shall
24 state any of the following that may still be tied to the contract and/or warranty:
25 1. Indicate that the date of the letter shall also be the beginning of the Warranty period.
26 2. Indicate any allowed due outs, reasons for them, and anticipated dates of finalization.
27 a. QMO issues such as off season testing of equipment
28 b. Off season training of equipment
29 D. The GC and all subcontractors shall finalize all warranty letters associated with their Work using the date noted
30 on the City Letter of Substantial Completion, and provide the CPM with all warranties as described in
31 Specification 01 78 36 Warranties. Upon receipt and final approval of the Warranties the CPM may initiate final
32 processing of the Final Progress Payment (100% contract total, less retainage).
33

34 **3.4. CONTRACT CLOSEOUT REQUIREMENTS**

- 35 A. The GC and all sub-contractors shall follow all requirements associated with documenting contract compliance
36 and provide documentation as required or requested by DCR or PW staff. All contractors are encouraged to stay
37 current with submissions of the following documentation:
38 1. Weekly Payroll Reports no later than the Progress Payment equal to 50% of the contract total.
39 2. Employee Utilization Reports
40 3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
41 4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
42 5. Documentation required for Small Business Enterprise (SBE) goals
43 6. Other documents as maybe required or requested through the Finalization Review Process
44 B. Near the Progress Payment equal to 80% of the contract total the GC shall request in writing a Finalization
45 Review. At that time DCR or PW staff shall prepare a report of all contract documentation submitted to date. A
46 list of missing items or outstanding issues will be emailed to the GC. No additional follow-up will be generated
47 by DCR or PW Staff.
48

49 **3.5. CONTRACT CLOSEOUT PROCEDURE**

- 50 A. The Contract Closeout Procedure will not begin until the Construction Closeout Procedure has been completed.
51 B. When the GC feels he/she has successfully met all of the Contract Closeout Requirements associated with
52 Section 3.3 above the GC may submit to the request for Final Payment to the CPM.
53 C. The CPM shall sign and submit the Final Payment request for processing.
54 D. DCR and PW staff shall do a complete review of all documentation associated with item 3.3.A above.
55 E. The GC shall be notified directly by DCR or PW Staff of any documentation that may still be missing, have
56 incomplete information, or other outstanding issues. It shall be the responsibility of the GC to continue follow-
57 up with DCR and PW staff until all documentation has been successfully submitted and accepted.

- 1 F. When all required documentation associated with Contract Closeout has been successfully submitted and
2 accepted by DCR and PW Staff the City of Madison shall process the Final Payment of any remaining monies
3 including retainage.
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END OF SECTION

SECTION 01 78 13
COMPLETION AND CORRECTION LIST

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PART 3 – EXECUTION – THIS SECTION NOT USED 1

PART 1 – GENERAL

1.1. SUMMARY

- A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are delivered for the contracted Work.
 - 1. The Progress Management Web Site is a Construction Management tool that provides contractors, consultants, and staff a single on-line location for the daily operations and progression of the Work.
 - 2. The Quality Management Observation (QMO) is an ongoing observation of the construction process as it progresses. The City of Madison does not use a "Punch List" or "Corrections List" as it is typically known throughout the construction industry. The QMO process acts as an "in progress punch list". Work identified as not in compliance with the contract documents by the Owner, Owner Representatives, Owner Consultants, etc. shall be resolved immediately at the Contractor's expense. Unresolved issues will be subject to withholding of progress payment(s) until completed.
 - 3. Very stringent expectations are tied to Construction Closeout and Contract Closeout procedures. Specific milestones throughout the project need to be met and the milestones are tied to the Progress Payment Schedule.
- B. All contractors shall be required to review the specifications identified in Section 1.2 below, and other related specifications identified therein to become familiar with the terminology and expectations of this City of Madison Public Works contract.

1.2. RELATED SPECIFICATIONS

- A. Section 01 29 76 Progress Payment Procedures
- B. Section 01 31 23 Project Management Web Site
- C. Section 01 45 16 Field Quality Control Procedures
- D. Section 01 77 00 Closeout Procedures

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

SECTION 01 78 36
WARRANTIES

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16

PART 1 – GENERAL

1.1. SUMMARY

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20 A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing all
21 Warranties and Guarantees related to the Work, workmanship, materials, equipment, and other such items
22 required by the Construction Documents.
23 B. Manufacturers’ disclaimers and limitations on product warranties do not relieve any contractor of the warranty
24 on the Work that includes the product.
25 C. Manufacturers’ disclaimers and limitations on product warranties do not relieve suppliers, manufacturers and
26 any contractor required to provide special warranties under the contract documents.
27

1.2. RELATED SPECIFICATIONS

- 28
29 A. Section 01 29 76 Progress Payment Procedures
30 B. Section 01 31 23 Project Management Web Site
31 C. Section 01 77 00 Closeout Procedures
32 D. Section 01 78 23 Operation and Maintenance Data
33 E. Other Divisions and Specifications that may address more specifically the requirements for Warranties related to
34 the installation of all items and equipment installed under the execution of the Work.
35

1.3. DEFINITIONS

- 36
37 A. See specification 01 77 00 for the definitions of the following terms that may also be used in this specification:
38 1. Substantial Compliance
39 2. Certificate of Occupancy
40 3. Certificate of Substantial Completion
41 4. Construction Closeout
42 5. Contract Closeout
43 B. Emergency Repair: The Owner or Owner Representative reserves the right to make emergency repairs as
44 required to keep equipment or materials in operation or to prevent damage to property and injury to persons
45 without voiding the contractors warranty or bond or relieving the contractor of his/her responsibilities during
46 the warranty period.
47 C. Installer: The company or contractor hired to install a finished product that was manufactured and supplied
48 specifically for the Work within this contract. The Installer may or may not be the same company that supplied
49 the product. See the definition for supplier.
50 D. Supplier: Any company that makes a specific finished product for the Work from information within the Contract
51 Documents. Examples of suppliers would include custom cabinets, steel stairs and railings, etc. A supplier would
52 not be a company that distributes items manufactured by others such as an electrical or plumbing supplier.
53 E. Warranty: A written guarantee from the manufacturer to the owner on the integrity of a product and its
54 installation, and the manufacturers’ responsibility to repair or replace the defective product or components
55 within a specified time from the date of ownership. Warranty may also be used interchangeably with
56 Guarantee. The following warranty types may be part of any specification within the Work associated with the
57 Construction Documents:

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1. Expressed Warranty: A warranty that provides specific repair or replacement for covered components of a product over a specified length of time.
 2. Implied Warranty: A warranty that is not stated explicitly by a seller or manufacturer that the product is merchantable and fit for the intended purpose.
 3. Standard Product Warranty: Preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner. Standard warranties may be for any amount of time but shall not be for anything less than one (1) year from the warranty date.
 4. Special Warranty: A written warranty required by the Contract Documents either to extend the time limit provided under a standard warranty or to provide greater rights to the Owner.
- F. Warranty Date: The effective date that begins all warranty periods required for products, installations, and work-manship associated with the execution of the Work for this contract. The Warranty Date shall be the date the Certificate of Substantial Completion was signed by the City Engineer.
- G. Related Damages and Losses: When correcting failed or damaged Warranted Work, remove and reinstall (or replace if necessary) the construction that has been damaged as a result of the failure or the construction that must be removed and replaced to obtain access for the correction of Warranted Work.
- H. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected reinstate the warranty by a new written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation unless specifically noted otherwise in a specification.
- I. Replacement Cost: All costs that may be associated with Work being replaced under warranty including but not limited to the following:
1. Related damages and losses
 2. Labor, material and equipment
 3. Permits and inspection fees
 4. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its anticipated useful service life.
- J. Replacement Work: All materials, products, required labor, and equipment necessary to replace failed or damaged warranted to an acceptable condition that complies with the requirements of the original Construction Documents.
- K. Owners Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, and remedies.
1. Rejection of Warranties: The Owner reserves the right to reject any warranty and to limit the selection of products with warranties not in conflict with the requirements of the contract documents.
 2. Where the Contract Documents require a Special Warranty or similar commitment on the Work or product, the Owner reserves the right to refuse acceptance of the Work until the Contractor presents evidence the entities required to countersign such required commitments have done so.

1.4. GENERAL CONTRACTORS RESPONSIBILITIES

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- A. The General Contractor (GC) shall be responsible to remedy, at his/her expense, any defect in the Work and any damage to City owned or controlled real or personal property when the damage is a result of:
1. The GC's failure to conform to Contract Document requirements.
 - a. Any substitutions not properly approved and authorized may be considered defective.
 2. Any defect in workmanship, materials, equipment, or design furnished by the GC or Sub-contractors.
- B. All warranties as described in this specification and these Contract Documents shall take effect on the date of the Certificate of Substantial Completion signed by the City Engineer as noted in Section 1.3.F above.
1. All warranties shall remain in effect for one (1) year thereafter unless specifically stated otherwise in the Contract Documents or where standard manufacturer warranties are greater.
- C. The GC's warranty with respect to Work repaired or replaced, including restored or replaced Work due to damage, will run for one (1) year from the date of Owner Acceptance of said repair or replacement.
1. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its anticipated useful service life.
- D. Warranty Response
1. See Section 3.5 of this specification.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. WARRANTY CHECKLIST

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Warranty Requirements to the GC.
- B. Each list shall indicate the title (and plan identifier when applicable) of the warranted item, the associated specification of the warranted item, the terms of the warranty (years), and a column to verify the item has been turned in and completed.
- C. The GC shall be responsible for all of the following:
 - 1. Consolidating all the warranty lists into one master Warranty Checklist.
 - a. The checklist shall be in a tabular data format similar to the sample below.
 - 2. Upload the completed checklist to the Submittal Library on the Project Management Web Site for review. See Specification 01 33 23 Submittals for more information on this procedure.
 - 3. Resubmit the schedule as needed after initial reviews have been completed.
- D. The GC shall work with all contractors to amend the Warranty Checklist throughout the execution of the project based on changes and modifications as necessary.

<u>Title</u>	<u>Specification</u>	<u>Terms</u>	<u>Completed</u>
Overhead Door Operator	08 36 00	MFR 2yr	
Exterior Bench and Trash Receptacles	12 93 00	MFR 3 year warranty on finish	
Kitchen Sink (SK-1)	22 42 00	MFR 5 year	
Disposal (D-1)	22 42 00	MFR 7 year parts and in-home service	
Toilet (WC-1)	22 42 00	MFR 1 year limited	

3.2. LETTERS OF WARRANTY

- A. All letters of warranty shall be in a typed letter format and provide the following information:
 - 1. The letter shall be on official company stationary including company name, address, and phone number.
 - 2. Indicate project name, contract number, and contract address the warranty is for on the reference line.
 - 3. Provide a description of the warranty(ies) being provided.
 - a. Include Division, Trade, or Specification information as necessary.
 - b. Only combine warranties of related Divisional Work together. Create new letters for additional Divisions as necessary.
 - 4. Indicate the effective Warranty Date. As noted in Section 1.3.F above, the Warranty Date shall be the date the Certificate of Substantial Completion was signed by the City Engineer.
 - 5. Contractor Letters of Warranty shall only be signed by a principal officer of the company.
 - 6. After signing the letter provide the GC with a high quality color scanned image in PDF format and the original signed letter.
- B. The GC shall be responsible for the Final Warranty submittal as identified in Section 3.4 below.
- C. The GC shall obtain letters of warranty from all of the following:
 - 1. The General Contractor shall provide warranty letters for all Work that was self performed under the contract documents, identify all trades or Divisions of Work.
 - 2. All Sub-contractors shall provide warranty letters for Work performed under the contract documents; identify all trades or Divisions of Work.
 - 3. Suppliers, as required by other specifications within the Construction Documents where the manufacture of a specific product unique to the Work of this contract was required.
 - a. The terms and conditions of the Supplier Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair, or replace defective materials and workmanship within one (1) year of the warranty date.
 - b. When the supplier is also the installer a single written letter may be submitted identifying both the warranty for the manufacture of the product and the warranty for the installation of the product.
 - 4. Installers as required by other specifications within the Construction Documents where the installation of a specific product unique to the Work of this contract was required.
 - 1. The terms and conditions of the Installer Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair,

- 1 or replace defective materials and workmanship associated with the installation of the product
2 within one (1) year of the warranty date.
3 5. Special Letters of Warranty shall be required from any contractor, supplier, installer or manufacturer who
4 agrees to provide warranty services required by any Division Specification in excess of their Standard
5 Product Warranty.
6

7 **3.3. STANDARD PRODUCT WARRANTY**

- 8 A. All contractors shall be responsible for collecting and providing copies of all standard product warranties for
9 commercially available products purchased and installed under this contract.
10 B. Only one copy of the manufacturers' standard warranty needs to be submitted as representative for all
11 quantities of the same model number used throughout the Work.
12 C. Provide the manufacturers certificate, letter, or other standard documentation for each Standard Product
13 Warranty submitted as follows:
14 1. Whenever possible a PDF version of the document shall be used.
15 a. If a PDF version is used all additional information shall be completed using simple PDF editing
16 tools such as text boxes, highlight, etc.
17 b. If a PDF version is not available and an original document is furnished the additional information
18 shall be neatly hand written and highlighted on the document in such a fashion so that it does not
19 obscure any part of the written warranty.
20 2. Provide the following additional information on each warranty document:
21 a. Contract warranty date.
22 b. Provide the manufacturer name and model number of the product if not specified within the
23 warranty.
24 i. Where the manufacturer name and model number is specified within the warranty it shall
25 be highlighted for visibility.
26 c. Provide the plan identifier (LAV-1, WC-2, etc) when applicable.
27 D. Each completed warranty shall be saved as a digital PDF. The file shall be named using the specification number
28 and item description. I.E. 22 42 00 Toilet (WC-1).pdf
29 a. Where an original certificate was furnished provide a high quality colored scan of the completed
30 document with the additional information. Save the scanned image in PDF format and use the
31 same naming convention as indicated above.
32 E. Provide all PDF files and any original documents to the GC for final consolidation to be provided to the Owner.
33

34 **3.4. FINAL WARRANTY SUBMITTAL**

- 35 A. The GC shall receive all required warranties (digital PDF and any original documents) from all contractors,
36 suppliers, installers and manufacturers.
37 B. The GC shall inventory all received warranties with the Warranty Submittal List to ensure all required warranties
38 have been received and all warranty periods are correct according to the specifications.
39 C. Provide with each Operation and Maintenance Manual a complete copy of any associated warranty.
40 D. Scan all warranties into a single organized electronic PDF file as follows:
41 1. Organize the PDF file into an orderly sequence based on the table of contents of the Specifications.
42 2. Provide a typed Table of Contents for the entire file at the front of the document.
43 3. Provide bookmarks and links to each individual PDF to enable quick navigation through the PDF
44 document.
45 E. Upload the warranty submittal to the appropriate document library on the Project Management Web Site for
46 review by the PA and CPM.
47 F. Correct any deficiencies or omissions and resubmit as necessary.
48

49 **3.5. WARRANTY NOTIFICATION, RESPONSE, EXECUTION AND FOLLOW-UP**

- 50 A. Warranty Notification:
51 1. The City of Madison, Project Management Web Site, uses an email notification system for all warranty
52 related issues. The GC will be required to provide, and keep current during the warranty period, a
53 minimum of two (2) email addresses and phone numbers of current employees to receive email
54 notifications and provide response regarding Work associated with these construction documents.
55 a. In the event a Warranty Issue is deemed by the City of Madison to be an emergency, the GC shall
56 first receive a phone call with a follow-up email from the Project Management Web Site.
57 b. The Contract Closeout-Warranty Issue Library on the Project Management Web Site uses a form
58 for each warranty issue that is logged into the system.

**SECTION 01 78 39
AS-BUILT DRAWINGS**

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PART 1 – GENERAL

1.1. SUMMARY

- 22 A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they
23 pertain to City of Madison contract procedures regarding the accurate recording of the Work associated with the
24 execution of this contract. This shall include but not be limited to work that will be hidden, concealed, or buried.
25 B. Each contractor shall be responsible for maintaining an accurate record of all installations, locations, and
26 changes to the contract documents during the execution of this contract as it may relate to their specific division
27 or trade.
28 C. The General Contractor (GC) shall be responsible for ensuring all contractors provide as-built record information
29 to the Master As-Built Document Set as described in this specification.
30

1.2. RELATED SPECIFCAITONS

- 32 A. 00 31 21 Survey Information
33 B. 01 26 13 Request for Information
34 C. 01 31 23 Construction Bulletin
35 D. 01 32 33 Photographic Documentation
36 E. 01 26 63 Change Orders
37 F. 01 29 76 Progress Payment Procedures
38 G. 01 31 23 Project Management Web Site
39 H. 01 33 23 Submittals
40 I. 01 77 00 Closeout Procedures
41 J. Other Divisions and Specifications that may address more specifically the requirements for field recording the
42 installation of all items associated with the execution of this contract by Division or Trade.
43

1.3. RELATED DOCUMENTS

- 45 A. Other related documents shall include but not be limited to the following:
46 1. Bidding documents including drawings, specifications, and addenda.
47 2. Required regulatory documents of conditional approval.
48 3. Field orders, verbal or written by inspectors having regulatory jurisdiction.
49 4. Shop drawings and installation drawings.
50

1.4. PERFORMANCE REQUIREMENTS

- 52 A. The GC shall be responsible for maintaining the “Master As-Built Document Set” in the job trailer at all times
53 during the execution of this contract. This document set shall include all of the following:
54 1. Master As-Built Plan Set
55 2. Master As-Built Specification Set
56 3. Other Document Sets

- 1 B. The GC shall designate one person of the GC staff to be responsible for maintaining the Master As-Built
2 Document Set at the job trailer. This shall include, posting updates, revisions, deletions and the monitoring of all
3 contractors posting as-built information as described in this specification.
4 C. All contractors shall use this specification as a general guideline regarding the requirements for documenting
5 their completed Work. Contractors shall explicitly follow additional specification requirements within their own
6 Division of Trade as it may apply to this specification.
7

8 **1.5. QUALITY ASSURANCE**

- 9 A. The GC shall be responsible for all of the following:
10 a. Spot checking all sub-contractors field documents to insure daily information is being recorded as
11 work progresses.
12 b. Discuss as-built recording to the plan set at weekly job meetings with all sub-contractors on site.
13 c. Schedule time with sub-contractors in the job trailer for recording as-built information to the plan
14 set.
15 d. Insure that all sub-contractors are providing clear and accurate information to the plan set in a
16 neat and organized manner.
17 e. Insure sub-contractors who have completed work have finalized recording all as-built information
18 to the plan set before releasing them from the project site.
19 B. The Project Architect, the City Project Manager, and other design team staff will perform random checks of the
20 Master As-Built Document Set during the execution of this contract to ensure as-built information is being
21 recorded in a timely fashion as the Work progresses. An updated and current Master As-Built Document Set is a
22 stipulation for approval of the progress payment.
23

24 **PART 2 – PRODUCTS**

25 **2.1. OFFICE SUPPLIES**

- 26 A. The GC shall provide a sufficient supply of office products in the job trailer at all times for all contractors to use in
27 recording as-built information into the plan set. This shall include but not be limited to the following:
28 a. Red ink pens, medium point. Pens that bleed through paper, markers, and felt tips will not be
29 accepted.
30 b. The use of highlighters is acceptable. Assign colors to various trades for consistency in recording
31 information.
32 c. Straight edges of various lengths for drawing dimension, extension and other lines.
33 d. Civil and Architectural scales
34 e. Clear transparent, non-yellowing, single sided tape.
35 f. Correction tape or correction fluid for correcting small errors.
36
37

38 **PART 3 - EXECUTION**

39 **3.1. FIELD DOCUMENT AS-BUILTS**

- 40 A. The GC and all Sub-contractors shall be responsible for keeping their own field set of as-built documents
41 including plans, specifications and published changes.
42 B. Field sets shall be kept dry and in good condition at all times.
43 C. No Work shall be buried, covered, or hidden, by any additional Work, regardless of Contractor or Trade, until
44 locations of all materials and equipment has been properly documented as described below.
45 D. All contractors shall be required to record the following as-built information:
46 a. Notes on the daily installation of materials and equipment.
47 b. Sketches, corrections, and markups indicating final location, positioning, and arrangement of
48 materials and equipment such as pipes, conduits, valves, cleanouts, pull boxes and other such
49 items. Note all final locations on plan sheets, indicate dimension off identifiable building features.
50 Riser diagrams need only be corrected for significant changes in locations, routing or
51 configuration.
52 i. The use of photographs in lieu of hand drawn sketches is acceptable.
53 ii. Photos shall be taken according to Specification 01 32 33 Photographic Documentation
54 iii. Print photo and markup with dimensions or notes as necessary.
55 c. Identify by the use of existing plan symbology and notes the size, type, quantity, and use as
56 applicable of materials such as pipes, valves, conduits, etc.
57

- 1 c. The Plan Set shall be available at anytime for easy reference during progress meetings and for
2 emergency location information of new work already completed.
- 3 2. The Master As-Built Specification Set (Spec Set) shall begin with one complete bid set of specifications
4 and any additional specifications that were supplied by published addenda during the bidding process.
5 The Spec Set shall be provided in three "D" ring type binders of sufficient thickness to accommodate the
6 specification set. Multiple binders are allowed as necessary. Label the front cover and binding edge with
7 "Master As-Built Specifications" in bold red letters. Provide other information as necessary to distinguish
8 the contents of multi-volume sets.
 - 9 a. The Spec Set shall be kept dry, legible, and in good condition at all times.
 - 10 b. The Spec Set shall be kept up to date with new revisions within two (2) working days of
11 supplemental drawings being issued.
 - 12 c. The Spec Set shall be available at anytime for easy reference during progress meetings.
- 13 3. Other Document Sets may be kept at the GCs option in three "D" ring type binders of sufficient thickness
14 to accommodate the documentation. Other documentation sets may include but not be limited to RFIs,
15 CBs, COs, etc.
- 16 C. The Land Surveyor Sub-Contractor shall be required to use digital surveying for all exterior site surveying, and
17 provide deliverable digital as-builts as specified in Specification 00 31 21 Survey Information. As soon as practical
18 the surveyor shall provide the GC with a preliminary copy of installed buried utilities for inclusion with the plan
19 set in the job trailer. The surveyor shall provide final digital as builts as per section 3.2 above.
- 20 D. All contractors shall be responsible for updating the Plan Set from their field sets at least once per work week.
21 Updates shall include but not be limited to the following procedures:
 - 22 a. All updates shall be done only in red ink. Place a "cloud" around small areas of correction to call
23 attention to the change.
 - 24 b. Whenever possible place general work notes, field sketches, supplemental details, photos, and
25 other such information on the reverse side of the preceding sheet. Installation notes including
26 dates shall be kept neatly organized in chronological order as necessary.
 - 27 c. Accurately locate items on the plan set as follows:
 - 28 i. For items that are located as dimensioned provide a check mark or circle indicating the
29 dimension was verified.
 - 30 ii. For items that are within 5 feet of the location indicated on the plans leave as shown and:
 - 31 • Provide correct dimensions to existing dimension strings or,
 - 32 • Accurately locate with new dimension strings
 - 33 iii. For items that are more than 5 feet from the location indicated on the plans
 - 34 • Accurately draw the items in the new location as installed and,
 - 35 • Accurately locate with new dimension strings and,
 - 36 • Note that the existing location is void.
 - 37 d. Include dimensioned locations for items that will be buried, concealed, or hidden in the ground,
38 under floors, in walls or above ceilings.
 - 39 i. Dimensions shall be pulled from identifiable building features, not from centers of columns
40 or other buried features.
 - 41 ii. When necessary pull more dimensions as needed from opposing directions to properly
42 locate single items.

3.4. AS-BUILT REVIEW AND ACCEPTANCE

- 45 A. The GC shall provide the Master As-Built Plan Set to the Project Architect (PA), the City Project Manager (CPM),
46 and other design team staff for content review prior to the Progress Payment Milestone indicated in
47 Specification 01 29 76 Progress Payment Procedures. The submitted plan set shall include the digital survey
48 information produced under Section 3.2 above.
 - 49 1. If the plan set is not approved:
 - 50 a. The PA and CPM shall only be required to generalize deficiencies by trade there shall be no
51 requirement or expectation to generate a "punch list" of required corrections.
 - 52 b. The GC and Sub-contractors as necessary shall be responsible for inspecting the installation and
53 correcting the drawings as needed.
 - 54 c. The GC shall re-submit the plan set for review.
 - 55 2. If the plan set is approved the PA shall take possession of the plan set to be used in providing the owner
56 with digital CAD record drawings. Upon completion of transferring the information to CAD the PA shall
57 provide the Owner with CAD record drawings, record PDFs, and the Master As-Built Plan Set.

- 1 **3.5. CHANGES AFTER ACCEPTANCE**
2 A. No Contractor shall be responsible for making changes to the As-Built record documents after acceptance by the
3 PA and CPM except when necessitated by changes resulting from any Work made by the Contractor as part of
4 his/her guarantee.

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END OF SECTION

**SECTION 01 78 43
SPARE PARTS AND EXTRA MATERIALS**

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17

PART 1 – GENERAL

1.1. SUMMARY

- 21 A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they
22 pertain to City of Madison contract procedures regarding spare parts, special tools, special materials, and extra
23 materials.
24 B. Each contractor shall be responsible for knowing the specific requirements of their Division Specifications as they
25 may relate to the general information provided in this specification.
26 C. The General Contractor (GC) shall be responsible for ensuring all contractors provide spare parts and extra
27 materials as described in this specification.
28

1.2. RELATED SPECIFICAITONS

- 30 A. 01 29 76 Progress Payment Procedures
31 B. 01 31 23 Project Management Web Site
32 C. 01 77 00 Closeout Procedures
33 D. Other Divisions and Specifications that may address more specifically how to proceed with spare parts, special
34 tools, special materials, and extra materials.
35

1.3. DEFINITIONS

- 37 A. Spare Parts: Any component of a product or assembly that comes pre-packaged or was specially ordered for the
38 explicit use of the product or assembly. This shall include but not be limited to fastening devices, mounting
39 brackets, replacement parts, wheels, pulleys, wiring, alternate assembly pieces, etc.
40 B. Special Tools: Any tool of any kind that was pre-packaged or specially ordered, and is required to be used for the
41 installation or maintenance of an installed product or assembly as part of this contract.
42 C. Special Materials: Any oil, lubricant, glue, touch-up paint, or other such material that comes pre-packaged or
43 was specially ordered and is required to be used for the installation or maintenance of an installed product or
44 assembly as part of this contract.
45 D. Extra Materials (Attic Stock): Any surplus materials in new and useable condition that was installed a part of this
46 contract. Attic Stock shall include but not be limited to the following: ceiling tiles, paint, stain, floor coverings,
47 ceramic tiles, light bulbs/lamps, filters, strainers, etc. Attic Stock shall include partially opened bulk items and
48 additional unopened quantities as directed by other specifications.
49

1.4. PERFORMANCE REQUIREMENTS

- 51 A. All contractors shall be responsible for consolidating spare parts, special tools, special materials, and attic stock
52 as it pertains to the specific Work within their Division or Trade.
53 B. All contractors shall use this specification as a general guideline regarding the requirements for turning spare
54 parts, special tools, special materials, and attic stock over to the owner. Contractors shall explicitly follow
55 specification requirements within their own Division of Trade.
56

1.5. QUALITY ASSURANCE

- 58 A. The General Contractor (GC) shall be responsible for all of the following:

- 1 1. Coordinate the location for and the delivery of all spare parts, special tools, special materials, and attic
2 stock being provided by all contractors under this contract to one centralized location as designated by
3 the Owner.
- 4 2. Verify that all items being delivered are:
 - 5 a. Clean, new, and in a usable condition.
 - 6 b. Properly sealed, protected, and labeled
 - 7 c. Properly documented

8
9 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

10
11 **PART 3 - EXECUTION**

12
13 **3.1. PACKAGING**

- 14 A. Whenever possible all surplus items should remain in their original packaging such as parts envelopes.
- 15 B. Package small parts in re-sealable plastic bags (Ziploc) or envelopes with clasp fasteners. Do not use envelopes
16 that seal with glue or tape envelopes closed. Do not leave packaging unsealed.
- 17 C. Package like parts together for products or assemblies. I.E. keep all spare parts for flushometers together.
- 18 D. Many small packages may be grouped together into a larger container by trade.
- 19 E. Do not use unrelated boxes or containers for packaging spare items. I.E. do not use a light fixture box for spare
20 breakers, or flushometers parts.

21
22 **3.2. LABELING**

- 23 A. Whenever possible the original labeling indicating part numbers and other pertinent information shall remain on
24 the original packaging.
- 25 B. If original labeling is not available the contractor shall label all parts and packages using tape or labels and
26 permanent black markers. Tape or labels being used shall absorb the permanent marker without bleeding or
27 allowing ink to be smeared or rubbed off.
- 28 C. Labels shall include the name of the product or equipment the item belongs to, part number and/or name, and
29 any other information that would assist maintenance personnel in identifying the piece and related product.
- 30 D. Labels shall include plan or specification designations (WC-1, LAV-3, DF-2, CPT-1, etc) that identify the particular
31 product or finish material it represents.
- 32 E. Labels for parts stored in clear re-sealable plastic bags may be placed inside the bag. Label shall face out and be
33 able to be read from one side. Multiple bags shall be numbered individually for identification.
- 34 F. Label the outside of large containers with the trade name (Plumbing, Electrical, etc).

35
36 **3.3. INVENTORY**

- 37 A. All contractors shall provide the GC with complete inventories of all spare parts, special tools, special materials,
38 and attic stock that they are providing at the end of the contract. The inventories shall be organized as follows:
 - 39 1. The cover sheet shall indicate the Contractors name, address, phone number, identify that the document
40 is the "Spare Parts and Extra Materials Inventory", and identify the Division or Trade the inventory is for.
 - 41 2. Provide an inventory in a tabular format of all items being provided under this and other specifications.
42 The minimum information to be provided for each item on the inventory shall be as follows:
 - 43 a. Bag or container number, all items of one bag or container shall be grouped together on the
44 inventory
 - 45 b. Item description
 - 46 c. Item size (if applicable)
 - 47 d. Total quantity provided
 - 48 e. Identify if item is a spare part, tool, special material, or attic stock
- 49 B. The GC shall consolidate inventories from all sub-contractors into one tabular data sheet organized by Division or
50 Trade of Work.
 - 51 1. Upon completing the consolidated list the GC shall upload the completed inventory to the Contract
52 Closeout-Attic Stock Library on the Project Management Web Site.
 - 53 2. The GC shall notify the Project Architect and City Project Manager that the scans have been uploaded.
 - 54 3. Consulting Staff and Owner Staff shall review the inventories prior to Final Review to verify that minimum
55 required quantities have been met. Deficiencies shall be noted and returned back to the GC for
56 corrective action.

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3.4. STORAGE

- A. Prior to the 80% Progress Payment milestone the GC shall coordinate with the City Project Manager and Maintenance Personnel where spare parts, special tools, special materials, and attic stock shall be stored.
- B. The GC shall instruct all contractors as to the location and proper storage procedures.
- C. The GC shall be responsible for ensuring the storage area is kept neat and orderly as follows:
 - 1. Like items are stored together by material, product, or trade as necessary.
 - 2. Liquids are stored in sealable containers and the lids have been properly installed to prevent drying out, spillage, etc.
 - 3. All labels are clearly visible and provide the required information.
- D. Large items shall be stored so as not to damage other items. Do not stack heavy items or items with distinct shapes/outlines on softer items that may get crushed or imprinted.

3.5. CLOSEOUT PROCEDURE

- A. Prior to the 90% Progress Payment milestone the GC shall review all attic stock already stored by the contractors to ensure the following:
 - 1. Materials are stored in the proper location(s).
 - 2. All boxes, containers and items are properly labeled according to the submitted/approved inventory.
 - 3. Quantities are correct according to the submitted/approved inventory.
- B. The GC shall ensure that all deficiencies are corrected prior to conducting Demonstration and Training Sessions.
- C. The GC shall review with Maintenance Staff all inventories and labeling during the scheduled Demonstration and Training Sessions.
- D. Any discrepancies associated with Attic Stock shall be resolved and verified prior to the CPM releasing the 90% CT progress payment.

END OF SECTION

**SECTION 01 79 00
DEMONSTRATION AND TRAINING**

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PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The purpose of this specification is to provide clear responsibilities and guidelines related to providing
21 Demonstration and Training (D&T) Sessions related to general facility use, equipment, systems, finishes, and
22 materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and Custodial Personnel) as
23 needed.
24 B. All D&T shall be coordinated through the General Contractor (GC), Project Architect (PA) and City Project
25 Manager (CPM), and will be based on or customized to the needs of City of Madison Staff being trained. New
26 equipment and systems may have complete D&T sessions as described in this specification while equipment or
27 systems staff is familiar with may have sessions more focused on maintenance only.
28

1.2. RELATED SPECIFICATIONS

- 29
30 A. Section 01 29 76 Progress Payment Procedures
31 B. Section 01 78 13 Completion and Correction List
32 C. Section 01 78 19 Maintenance Contracts
33 D. Section 01 78 23 Operation and Maintenance Data
34 E. Section 01 78 36 Warranties
35 F. Section 01 78 39 As-Built Drawings
36 G. Section 01 78 43 Spare Parts and Extra Materials
37 H. Other Divisions and Specifications that may address more specifically the requirements for D&T sessions related
38 to the installation of all items and equipment installed under the execution of the Work.
39

1.3. QUALITY ASSURANCE

- 40
41 A. All contractors shall have the responsibility of preparing for and conducting D&T sessions as determined by this
42 and other Division or Trade related specifications, Owner Operation and Maintenance Manuals, and other such
43 documentation related to the Work.
44 B. The GC shall have responsibility for:
45 1. Ensuring that all contractors required to conduct a D&T session have successfully completed all of the
46 following:
47 a. Turned in all required documentation for review and documentation has been approved/accepted
48 prior to scheduling D&T sessions.
49 b. Other required documentation as needed is available and ready for use during the D&T session.
50 c. All systems have been started, tested, and running as per appropriate specification and/or
51 manufacturers recommendations prior to scheduling D&T sessions.
52 d. All contractors are sufficiently prepared for their D&T session
53 e. Documents the D&T session including date, time, contractor and company name, attendees and
54 other information regarding the session
55 2. Organizing the coordination and scheduling of all D&T sessions between all contractors and the
56 appropriate representatives of the Owner. These representatives may include any of the following
57 depending on the Work of the Contract:
58 a. Owner – end users

- b. Facility Maintenance personnel
 - i. Facility general operation procedures including custodial services
 - ii. Electrical
 - iii. Mechanical
 - iv. Plumbing
 - v. Site
- c. Information Technology (IT) Department
- d. Traffic Engineering – Radio Shop
- e. Architects, Engineers and Facility Management staff as project completion overview

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

- A. The GC shall develop a specific D&T plan to be scheduled and conducted as described below but no sooner than the meeting discussed in 3.2.A.2 below.
- C. The GC shall not schedule D&T sessions to preclude required personnel from attending multiple sessions.

3.2. COORDINATING AND SCHEDULING THE TRAINING

- A. The GC, PA, and CPM, shall review all Training and Demonstration requirements during two (2) special meetings.
 - 1. The first meeting shall be held at the 50% Contract Total Payment. During this meeting the following shall be discussed:
 - a. Preliminary schedule of training dates to be completed prior to beginning construction closeout.
 - b. List of documentation and items that need to be completed and available before and during the training session.
 - c. Who (Owner, Maintenance, etc) will be attending what training session(s).
 - 2. The second meeting shall be held at the 80% Contract Total Payment. This meeting shall review due outs that have not yet been completed for the 90% Contract Total Payment and the requirements necessary for Construction Closeout. All Demonstration and Training sessions shall be completed prior to receiving the 90% progress payment and beginning Construction Closeout Procedures (see Specification 01 77 00).
 - a. This does not include any requirement associated with off season equipment preparation and/or demonstration and Training Sessions.
- B. All of the Construction Work shall be operationally ready prior to conducting training as follows:
 - 1. All contractors shall have their As-Built Drawing Records available for reviewing locations of system components during training.
 - 2. All final and approved Operations and Maintenance Data shall be completed no less than two (2) full weeks prior to the scheduled training.
 - 3. All systems shall have been started, functionally tested, balanced, and fully operational, and all piping and equipment labeling complete at least two (2) days prior to the scheduled training.
 - a. Seasonal equipment shall not be trained out of season. Contractors having seasonal equipment shall work with the GC and CPM for coordinating additional training sessions as appropriate for seasonal equipment.
- C. Correction list items that prevent a piece of equipment or system from being fully operational for training shall be corrected prior to conducting the training.

3.3. TRAINING OBJECTIVES

- A. For each piece of equipment or system installed train on the following objectives/topics as applicable:
 - 1. System design, concept, and capabilities
 - 2. Review of related contractor as-built drawings
 - 3. Facility walkthrough to identify key components of the system
 - 4. System operation and programming including weekly, monthly, annual test procedures
 - 5. System maintenance requirements
 - 6. System troubleshooting procedures
 - 7. Testing, inspection, and reporting requirements associated with any regulatory requirements
 - 8. Identification of any correction list items still outstanding
 - 9. Review of system documentation including the following:
 - a. Operation and maintenance data

- 1 b. Warranties
- 2 c. Valve charts, tags, and pipe identification markers
- 3 B. For each piece of specialty equipment train on the following objectives/topics as applicable:
- 4 1. Manufacturers operations instructions
- 5 2. Manufacturers use and care instructions
- 6 3. Manufacturers maintenance and troubleshooting instructions
- 7 4. System operation and programming including weekly, monthly, annual test procedures
- 8 5. Identification of any correction list items still outstanding
- 9 6. Review of system documentation including the following:
- 10 a. Operation and maintenance data
- 11 b. Warranties
- 12 C. End User Orientation
- 13 1. Facility walkthrough
- 14 2. Security and emergency features
- 15 3. General facility operation procedures
- 16 D. Facility General Use and Custodial Services – if requested
- 17 1. Facility walkthrough
- 18 2. Security and emergency features
- 19 3. General facility operation procedures
- 20 4. Care and maintenance of specialty items, finishes, etc as requested
- 21 5. Attic stock inventory and material designations
- 22

23 **3.4. DEMONSTRATION AND TRAINING PROGRAM PREPARATION**

- 24 A. Each contractor having a responsibility for providing D&T sessions shall meet with the GC, CPM, and other City
- 25 Staff as needed to review the extent of the Training Objectives in section 3.3 above needed for each piece of
- 26 equipment, system, finish, etc. This meeting shall occur no less than four (4) weeks prior to the anticipated
- 27 training session.
- 28 B. The contractor shall use the information from item 3.4.A above to prepare a formal training program for each
- 29 piece of equipment or system based on the Training Objectives in 3.3 above.
- 30 1. The formal training program shall include the following information:
- 31 a. Session title
- 32 b. List of systems, equipment, use, care, etc to be covered during the session
- 33 c. Provide the following for each systems, equipment, use, care, etc to be covered during the session
- 34 i. Name and affiliation of each instructor to be used. As needed and discretion of the Owner
- 35 the GC to require attendance by the installing technician, installing Contractor and the
- 36 appropriate trade or manufacturer’s representative.
- 37 ii. Qualifications of each instructor to be used. Practical building operation expertise as well
- 38 as in-depth knowledge of all modes of operation of the specific piece of equipment as
- 39 installed in this project is required by the training personnel. If Owner determines training
- 40 was not adequate, the training shall be repeated until acceptable to Owner.
- 41 iii. A checklist of all documentation and system/equipment requirements necessary to
- 42 complete a successful training session and the current status of each
- 43 iv. Any additional documents, training aids, video or other items to be used to complete the
- 44 training
- 45 v. Any special requirements or needs associated with item iv above to complete the training
- 46 d. The intended audience for the training
- 47 e. The approximate duration of each objective or topic to be covered
- 48 2. Submit the completed training program to the GC for review and approval by the PA and CPM.
- 49 C. The PA and CPM shall work with staff as necessary to ensure all points of anticipated training needs have been
- 50 met. The PA and CPM will approve the program as submitted or recommend changes for re-submittal as
- 51 necessary.
- 52

53 **3.5. CONDUCTING A DEMONSTRATION AND TRAINING SESSION**

- 54 A. All contractors shall conduct their required D&T Sessions as follows:
- 55 1. Begin with a classroom session
- 56 a. Provide a sign in sheet indicating all training to be conducted, instructors, etc.
- 57 b. Provide an overview of the training to be conducted including the approximate schedule.
- 58 2. Conduct a general walk-through of the site.

- 1 a. Point out locations of various equipment, valves, charts, and other related items.
- 2 b. Use the Division or Trade As-Built record drawings to indicate locations of hidden or buried items.
- 3 3. Provide a demonstration of general equipment/system operation including using the O&M manual.
- 4 a. Startup and shutdown procedures.
- 5 b. Normal operational levels as depicted by any gauges, software, etc.
- 6 c. Indicate warning devices, signs etc. and demonstrate emergency shut-down procedures.
- 7 4. Provide a demonstration of all owner level maintenance using the O&M manual.
- 8 a. Indicate frequency of maintenance.
- 9 b. Provide and review all spare parts, special tools, and special materials.
- 10 5. Provide and review all spare parts, special tools, special materials, or attic stock as applicable.
- 11 6. While conducting D&T sessions:
- 12 a. Allow hands on training whenever practical.
- 13 b. Answer questions promptly
- 14 c. Repeat demonstrations and procedures as necessary.
- 15 B. Within two (2) working days of completing the D&T session the contractor responsible for the session shall turn-
- 16 in any documentation generated including the sign in roster to the GC.
- 17 C. The GC shall turn over all training documentation to the PA and CPM upon completion of D&T sessions.
- 18 D. Re-schedule any training that has been determined to be inadequate or inappropriate for any reason including
- 19 but not limited to any of the following;
- 20 1. Unqualified instructor
- 21 2. System installation incomplete or untested to the specifications
- 22 3. Equipment failure during demonstration
- 23 4. Un-expected cancellation
- 24

25 **3.6. CLOSEOUT PROCEDURE**

- 26 A. Prior to receiving the 90% Progress payment the GC shall:
- 27 1. Verify with the PA and CPM that each Demonstration and Training Session was conducted properly and
- 28 according to the submitted plan.
- 29 2. Any required "Off Season" equipment testing, balancing, and Demonstration and Training Sessions have
- 30 been tentatively scheduled with the GC, necessary sub-contractors, instructors and Owner/Owner
- 31 Representatives as necessary.
- 32
- 33
- 34

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

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PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing well
21 documented and complete Operation and Maintenance (O&M) Data related to general facility use, equipment,
22 systems, finishes, and materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and
23 Custodial Personnel) as needed.
24 B. Operation and Maintenance Data shall apply to both of the following categories except where specific
25 requirements are noted under their separate titles as follows:
26 1. Operation and Maintenance Data: Generally shall mean the owner manual that provides information on
27 start-up, shut-down, operation, troubleshooting, maintenance, parts, and other such documentation as it
28 pertains to all equipment and systems installed under the Work.
29 2. Use and Care instructions: Where applicable use and care instructions shall also be considered O&M for
30 such things as flooring, tile, partitions, and other such finishes and trim related items, installed under the
31 Work.
32

1.2. RELATED SPECIFICATIONS

- 33
34 A. Section 01 29 76 Progress Payment Procedures
35 B. Section 01 31 23 Project Management Web Site
36 C. Section 01 77 00 Closeout Procedures
37 D. Section 01 78 13 Completion and Correction List
38 E. Section 01 78 19 Maintenance Contracts
39 F. Section 01 78 36 Warranties
40 G. Section 01 79 00 Demonstration and Training
41 H. Other Divisions and Specifications that may address more specifically the requirements for O&M Data.
42

1.3. QUALITY ASSURANCE

- 43
44 A. All O&M Data shall meet the requirements identified in Section 1.4 below.
45 B. All contractors shall provide O&M Data for each piece of equipment, system, or finish installed during the
46 installation of the Work. O&M Data shall be provided to the General Contractor (GC) for verification and
47 submittal.
48 C. The GC shall be responsible for receiving all required O&M Data files from all contractors for verifying that all
49 files submitted meet the requirements in Section 1.4 below.
50

1.4. O&M DATA REQUIREMENTS

- 51
52 A. O&M Data shall be provided in digital PDF format as follows:
53 1. PDF files shall be complete first generation consumer useable editions of PDF documents as provided by
54 any of the following:
55 a. Product manufacturer
56 b. Supplier of product
57 c. Product manufacturer internet site
58 2. Acceptable PDF files shall have the following functionality:

- 1 a. Word searchable
- 2 b. Key areas are bookmarked
- 3 c. Table of Contents and/or Index linked to content is preferred whenever possible.
- 4 3. Scanned printed material, with word searchable capabilities, saved as a PDF, is not acceptable and will be
- 5 rejected without further review.
- 6 B. O&M Data shall include but not be limited to the following manufacturers' published information as appropriate
- 7 for the equipment, system, material, or finish:
- 8 1. Installation instructions
- 9 2. Parts lists, assembly diagrams, explosion diagrams
- 10 3. Wiring diagrams
- 11 4. Start-up, shut-down, troubleshooting and other related operation procedures
- 12 5. Lubrication, testing, parts replacement, and other such maintenance procedures
- 13 6. General use, care, and cleaning instructions
- 14 7. Special precautions and safety requirements
- 15 8. A list of certified equipment vendors, service companies, parts suppliers including company name,
- 16 address, and phone number
- 17 9. A list of the recommended spare parts to have on hand at all times
- 18 10. A list by type of all recommended lubes, oils, packing material, and other maintenance supplies
- 19 11. Copies of final test reports, balance reports, and other related documentation
- 20 12. Warranty information for equipment and systems
- 21

22 1.5. O&M DATA SUBMITTALS

- 23 A. O&M Data shall be prepared as identified in this specification and shall be submitted for review as per the
- 24 schedule identified in Specification Section 01 29 76, Progress Payment Procedures.
- 25 B. O&M Data Draft submittals will be reviewed for content, procedure, and compliance only. A general critique
- 26 with recommendations for improvement will be made but re-submittals will not be required.
- 27 C. O&M Data Final submittals will be reviewed for content, procedure, and compliance. Re-submittals will be
- 28 required until such time as each submittal is accepted.
- 29

30 *NOTE: Acceptance of O&M Data Final submittals is required to be complete prior to scheduling and conducting owner*

31 *related training and construction closeout.*

32 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

33 **PART 3 - EXECUTION**

34 **3.1. O&M DATA PREPARATION - GENERAL**

- 35 A. All contractors shall prepare O&M Data for draft and final submission as follows:
- 36 1. Obtain digital PDF files for each piece of equipment, system, material or finish as described in Sections
- 37 1.4.A.1 and 1.4.A.2 above.
- 38 2. Verify that all information as described in Section 1.4.B above is included with the PDF file. Obtain
- 39 missing information as necessary for a complete submittal.
- 40 B. Rename each individual PDF file as follows.
- 41 1. Do not use special characters such as #, %, &, /, etc. These characters are reserved by the Project
- 42 Management Web Site software the City of Madison uses; however the under-score (or under-bar) '_' is
- 43 an allowed character.
- 44 2. Use the following format and examples for renaming your file:
- 45 a. Format: ***Equipment name_What_Project name_Contract number_Year***
- 46 i. *Equipment Name* represents the name of any equipment, system, material or finish as
- 47 designated in the Contract Documents.
- 48 ii. *What* represents what the file is about
- 49 iii. *Project Name* represents the title of the project or contract. A shortened version of the
- 50 title may be identified by the City Project Manager to be used by all contractors.
- 51 iv. *Contract number* is the specific identification number the Work was bid under and appears
- 52 on the plan set title sheet and in each sheet title block
- 53 v. *Year* represents the year the contract will be closed out
- 54 b. Examples of file names
- 55 i. AHU 2_Operation Manual_Fire Admin_1234_2015
- 56
- 57
- 58

- 1 ii. CPT 2_Use and Care_MPD West_9876_2011
2 C. All contractors shall submit the completed digital PDF files to the GC in sufficient time for the GC to meet the
3 O&M Data submission deadlines as described in Specification Section 01 29 76, Progress Payment Procedures.
4 D. O&M Data shall be submitted and reviewed as described in sections 3.2 and 3.3 below.
5

6 **3.2. O&M DATA DRAFT SUBMITTAL**

- 7 A. All contractors shall prepare and submit the following for an O&M Data Draft review submittal:
8 1. Prepare three (3) complete O&M Data file samples as described in section 3.1 above.
9 2. Review all specifications within his/her Division of Work and prepare a complete O&M Data checklist
10 listing all equipment, systems, materials, or finishes. Checklist shall be in tabular form similar to the
11 example below and shall indicate the title (and plan identifier when applicable) of the O&M Data, the
12 associated specification, and a column to verify the item has been turned in and completed.
13 B. The GC shall be required to review all contractors' samples and checklists for compliance with this specification
14 and shall return any to the originating contractor that are insufficient for re-submittal.
15 1. When acceptable to the GC, he/she shall upload each O&M Data draft submittal file to the O&M Draft
16 library on the Project Management Web Site.
17 C. The Project Architect, City Project Manager, Consulting Staffs and Owner Representatives shall review the O&M
18 Data draft submittals and checklist within fifteen 15 working days as follows:
19 1. Provide general critique comments by Division on O&M Data samples submitted. Critique is intended to
20 provide all contractors with information on strengths and weaknesses of their submittals.
21 a. Re-submittal of the O&M Data samples will not be required.
22 2. Review in detail the O&M Data Checklist for completeness. Provide comments as needed.
23 a. Re-submittal of the O&M Checklist will be required until accepted.
24

<u>Title</u>	<u>Specification</u>	<u>Completed</u>
Overhead Door Operator	08 36 00	
Air Handling Unit (AHU-3)	23 00 00	
Water Heater (WH-1)	22 30 00	

25

26 **3.3. O&M DATA FINAL SUBMITTAL**

- 27 A. All contractors shall prepare and submit the following for an O&M Data Final review submittal:
28 1. Prepare complete O&M Data files as described in Section 3.1 above according to their approved checklist
29 as described in Section 3.2 above.
30 2. Submit completed checklist and all final O&M Data files to the GC for final submittal review.
31 B. The GC shall be required to spot check all contractors' submittals for completeness against their checklists and
32 for compliance with this specification and shall return any to the originating contractor that are insufficient for
33 re-submittal.
34 1. When acceptable to the GC, he/she shall upload each O&M Data final submittal file to the O&M Final
35 library on the Project Management Web Site.
36 C. The Project Architect, City Project Manager, Consulting Staffs and Owner Representatives shall review the O&M
37 Data final submittals and checklist within fifteen (15) working days as follows:
38 1. Review the files submitted against the checklist and request any missing files through the GC.
39 2. Review in detail all of the O&M Data files for completeness.
40 a. Submittals shall be accepted or rejected as individual PDF files.
41 b. Contractors shall re-submit entire O&M submittal if any portion is rejected or incomplete.
42

43 **3.4. CONSTRUCTION CLOSEOUT**

- 44 A. All contractors shall review Specification 01 77 00, Closeout Procedures and Specification 01 79 00
45 Demonstration and Training.
46 1. Acceptance of all final O&M Data submittals is required prior to scheduling Demonstration and Training
47 Sessions.
48 2. Completion of all Demonstration and Training Sessions is required to receive the Substantial Compliance
49 for Occupancy Certificate, and to begin Construction Closeout procedures.
50

51

52

53

END OF SECTION

1 SECTION 024119 – SELECTIVE DEMOLITION, ALTERATION, AND PATCHING

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes the following:

- 8 1. Selective demolition at and within the existing building.
9 2. Restoration of surfaces altered by demolition.

10 1.3 SUBMITTALS

- 11 A. Submit to A/E, permits and notices authorizing demolition if required.

12 1.4 QUALITY ASSURANCE

- 13 A. Regulatory Requirements: Comply with governing state or local government agency regulations before
14 beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

15 1.5 PROTECTION

- 16 A. Do not interfere with use and operation of existing adjacent work areas. Maintain free and safe passage
17 to and from.
- 18 B. Cease operations and notify Owner and A/E immediately if safety of adjacent work areas appears to be
19 endangered. Do not resume operations until safety is restored.
- 20 C. Protect existing work not indicated or scheduled to be altered. Promptly repair damages at no cost to the
21 Owner.
- 22 D. Provide, erect and maintain safety devices as required to protect general public, workers, and adjoining
23 work area employees.

24 **PART 2 - PRODUCTS**

25 2.1 MATERIALS

- 26 A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the
27 Owner's property, demolished materials shall become the Contractor's property and shall be removed
28 from the site. Store items as directed by Owner.

1 2.2 SALVAGED MATERIALS
2 A. Conform to requirements specified in Division One – General Requirements– Alteration Project
3 Procedures.

4 2.3 PRODUCTS FOR PATCHING
5 A. Provide as required to match adjacent surfaces or as indicated.

6 **PART 3 - EXECUTION**

7 3.1 DEMOLITION
8 A. Demolish in an orderly and careful manner as required to salvage products indicated.
9 B. Perform demolition in accordance with applicable authorities having jurisdiction.
10 C. Repair all demolition performed in excess of that required at no cost to the Owner.
11 D. Remove demolished materials, tools and equipment from site upon completion of work. Leave site in a
12 condition acceptable to A/E.

13 3.2 SALVAGE
14 A. Carefully remove, salvage, and turn over to Owner items designated on the Drawings to be salvaged,
15 including but not limited to the following items:
16 1. Doors

17 3.3 PATCHING
18 A. Comply with installation requirements specified elsewhere for products used.
19 B. Patch all damaged surfaces with products to match adjacent finishes.

20
21 END OF SECTION 024119

1 SECTION 060110 - ROUGH CARPENTRY

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes the following:

- 8 1. Wood furring and grounds.
9 2. Plywood backing panels.

10 1.3 DELIVERY, STORAGE, AND HANDLING

- 11 A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation
12 around stacks and under coverings.

13 **PART 2 - PRODUCTS**

14 2.1 FIRE-RETARDANT-TREATED MATERIALS

- 15 A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

- 16 1. Use Exterior type for exterior locations and where indicated.
17 2. Use Interior Type A, High Temperature (HT) for enclosed roof framing and where indicated.
18 3. Use Interior Type A, unless otherwise indicated.

- 19 B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting
20 agency acceptable to authorities having jurisdiction.

- 21 C. Application: Treat all rough carpentry, unless otherwise indicated.

- 22 1. Plywood backing panels.

23 2.2 MISCELLANEOUS LUMBER

- 24 A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other
25 construction, including the following:

- 26 1. Furring.
27 2. Grounds.

- 28 B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent
29 maximum moisture content of any species.

1 C. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of
2 producing bent-over nails and damage to paneling.

3 2.3 PLYWOOD BACKING PANELS

4 A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if
5 not indicated, not less than 1/2-inch (13-mm) nominal thickness.

6 2.4 FASTENERS

7 A. General: Provide fasteners of size and type indicated that comply with requirements specified in this
8 Article for material and manufacture.

9 B. Power-Driven Fasteners: NES NER-272.

10 C. Wood Screws: ASME B18.6.1.

11 **PART 3 - EXECUTION**

12 3.1 INSTALLATION, GENERAL

13 A. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying
14 with the following:

15 3.2 WOOD BLOCKING INSTALLATION

16 A. Install level and plumb with cut edges treated. Secure to resist anticipated loading of equipment and
17 casework.

18 3.3 WOOD FURRING INSTALLATION

19 A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for
20 tolerance of finish work.

21 END OF SECTION 060110

1 SECTION 060120 – FINISH CARPENTRY

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes the following:
8 1. Standing and Running trim.
- 9 B. Related Sections include the following:
10 1. Section 060110: Rough Carpentry
11 2. Section 064100: Architectural Woodwork

12 1.3 SUBMITTALS

- 13 A. Submit samples and shop drawings in accordance with the General Requirements.
- 14 B. Product Data: For each type of product indicated, including cabinet hardware and accessories.
- 15 C. Samples:
16 1. 6” length of each type, profile, and surface finish.
- 17 D. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details,
18 attachment devices, and other components.
19 1. Indicate materials, component profiles, fastening, jointing details, and accessories.
- 20 E. Quality Assurance: Perform finish carpentry work in accordance with recommendations of the Millwork
21 Standards of the Architectural Woodwork Institute.

22 1.4 DELIVERY, STORAGE, AND HANDLING

- 23 A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been
24 completed in installation areas. If woodwork must be stored in other than installation areas, store only in
25 areas where environmental conditions comply with requirements specified in "Project Conditions"
26 Article.

27 1.5 PROJECT CONDITIONS

- 28 A. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of
29 other construction by field measurements before fabrication, and indicate measurements on Shop
30 Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
31 1. Installer shall advise Prime Contractor of temperature and humidity requirements for finish
32 carpentry installation areas. Do not install finish carpentry until a minimum of 60 deg. F and

1 relative humidity of 25-55 percent have been stabilized and will be maintained in installation
2 areas.

3 **PART 2 - PRODUCTS**

4 2.1 MATERIALS

5 A. General

- 6 1. Nominal sizes are indicated, except as shown by detailed dimensions, Provide dressed or worked
7 and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to
8 actual sizes and patterns as shown, unless otherwise indicated.
- 9 2. Optimum Moisture Content: Kiln-dry finish carpentry woodwork to an average moisture content
10 of 8 percent, or as otherwise recommended by applicable AWI Quality Standards for the regional
11 climatic conditions involved.

12 B. Interior Finish Carpentry:

- 13 1. Standing and Running Trim: AWI Premium Grade
 - 14 a. Species: Match Existing
 - 15 b. Finish: Match Existing
- 16 2. Miscellaneous lumber for blocking, furring: Provide materials and comply with provisions
17 specified in Section 06100.
- 18 3. Particleboard: NPA 1-M-2
- 19 4. Hardboard: AHA A135.4

20 C. Fasteners and Anchorages:

- 21 1. Provide all nails, spikes, screws, lag screws, steel angles, hangers, bolts, nuts, washers, and other
22 anchoring devices of the type, size, material, and finish required for application indicated to
23 provide secure attachment, concealed where possible, and complying with applicable Federal
24 Specifications.

25 2.2 FABRICATION

- 26 A. Fabricate Interior Standing and Running Trim to dimensions, profiles, and details indicated for intended
27 use in accordance with AWI Section 300, Premium Grade

28 **PART 3 - EXECUTION**

29 3.1 PREPARATION

- 30 A. Field Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain
31 measurements and verify dimensions to assure accurate fit.
- 32 B. Preparation of Surfaces: Deliver materials and fabrications to Section 09912 contractor for back priming
33 and/or pre-finishing prior to installation. Back prime wood materials for painted finish exposed to
34 moisture and high relative humidity.
- 35 C. Condition wood materials to average prevailing humidity conditions in installation areas prior to
36 installing.

- 1 3.2 INSTALLATION
- 2 A. Quality Standard: Install standing and running trim, interior frames and jambs, and other finish carpentry
- 3 work to comply with AWI section 1700 for the same grade specified in Part 2 of this section for type of
- 4 finish carpentry work involved.
- 5 B. Apply all nails, spikes, screws, lag screws, steel angles, hangers, bolts, nuts, washers, anchors, and other
- 6 items of hardware required for the assembling and securing of this work. Use best suitable type of nails
- 7 and anchors for various types of carpentry. Use annular nails and other special nails where required.
- 8 Correct and defective work caused by inadequate nailing, holding power or nails used and the use of nails
- 9 which result in the staining of other materials. All finish work shall have nails set for puttying. Recess
- 10 all screws and bolt heads and provide flush hardwood plugs where exposed.
- 11 C. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately
- 12 seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or
- 13 which are of defective manufacturer with respect to surfaces, sizes or patterns.
- 14 D. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed
- 15 shims. Install to a tolerance of 1/8 inch in 8 feet for plumb and level countertops; and with 1/16 inch
- 16 maximum offset in flush adjoining surfaces and 1/8 inch maximum offsets in revealed adjoining surfaces.
- 17 E. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- 18 F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces
- 19 (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent
- 20 and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface
- 21 contact throughout length of joint. Use scarf joints for end-to-end joints. Use construction adhesives of
- 22 type recommended by manufacturer for use intended. Sort trim to achieve close match of graining for
- 23 each assembly, especially if splicing is required.
- 24 G. Countertops: Cut, fit, scribe and secure in place.
- 25 3.3 ADJUSTING AND CLEANING
- 26 A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally
- 27 and visually; where not possible to repair properly, replace woodwork at no cost to Owner. Adjust
- 28 joinery for uniform appearance.
- 29 B. Cleaning: Clean all work of this Section prior to acceptance by Owner, including installed work
- 30 furnished by others.
- 31 C. Adjustment: Adjust all hardware for proper operation.
- 32 D. Protection: Protect all work of this Section until acceptance by Owner. Advise GC of final protection and
- 33 maintained conditions necessary to ensure that work will be without damage or deterioration at time of
- 34 acceptance.
- 35 3.4 END OF SECTION 060120

1 SECTION 06410 - ARCHITECTURAL WOODWORK

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes the following:

- 8 1. Cabinets
9 2. Counter Tops

- 10 B. Related Sections include the following:

- 11 1. Section 06100: Rough Carpentry
12 2. Section 06200: Finish Carpentry

13 1.3 DEFINITIONS

- 14 A. Exposed Surfaces: Exposed surfaces shall include portions of casework surfaces visible when doors and
15 drawers are closed; bottoms of casework 48 inches or more above finish floor; tops of casework less than
16 72 inches above finish floor; visible surfaces in open casework or behind glass doors; portions of
17 casework visible when fixed equipment is installed; and front edges of cabinet body members visible
18 though a gap greater than 1/8 inch with doors and drawers closed

- 19 1. For the purpose of finishing, both sides of cabinet doors shall be considered "exposed"

- 20 B. Semi-Exposed Surfaces: Semi-exposed surfaces shall include portions of casework surfaces visible when
21 doors and drawers are in the open position; bottoms of casework are between 30 inches and up to 48
22 inches above finish floor; and front edges of shelving behind doors.

- 23 C. Concealed Surfaces: Concealed surfaces shall include portions of casework surfaces not visible after
24 installation; bottoms of casework less than 30 inches above finish floor; tops of casework over 72 inches
25 above finish floor; stretchers, blocking and components are concealed by drawers; and corners are created
26 by tall, wall, or base cabinets, and shall be non-accessible.

27 1.4 SUBMITTALS

- 28 A. Submit samples and shop drawings in accordance with the General Requirements.

- 29 B. Product Data: For each type of product indicated, including cabinet hardware and accessories.

- 30 C. Samples:

- 31 1. For each type of Plastic Laminate, 8x8 for each type, color, and surface finish.

- 32 D. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details,
33 attachment devices, and other components.

- 1 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking
2 and reinforcement specified in other Sections.
- 3 E. Quality Submittals:
4 1. Product Data: For installation adhesives, including printed statement of VOC content.
5 2. Product Data:
6 a. Composite wood manufacturer's product data for each composite wood product used
7 indicating that the bonding agent contains no urea formaldehyde.
8 b. For each adhesive used, documentation indicating that the adhesive contains no urea
9 formaldehyde.
10 3. Quality Certification: Submit woodwork fabricator's certification, stating that fabricated
11 woodwork complies with quality grades and other requirements indicated.

12 1.5 DELIVERY, STORAGE, AND HANDLING

- 13 A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been
14 completed in installation areas. If woodwork must be stored in other than installation areas, store only in
15 areas where environmental conditions comply with requirements specified in "Project Conditions"
16 Article.

17 1.6 PROJECT CONDITIONS

- 18 A. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of
19 other construction by field measurements before fabrication, and indicate measurements on Shop
20 Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
21 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field
22 measurements before being enclosed, and indicate measurements on Shop Drawings.

23 **PART 2 - PRODUCTS**

24 2.1 MATERIALS

- 25 A. General:
26 1. Provide materials that comply with requirements of the AWI quality standard for each type of
27 woodwork and quality grade indicated and, where the following products are part of interior
28 woodwork, with requirements of the referenced product standards that apply to product
29 characteristics indicated.
- 30 B. Optimum moisture content: kin-dry architectural woodwork to an average moisture content of 8 percent
31 or as otherwise recommended by applicable Quality Standards for the regional climatic conditions
32 involved.
- 33 C. Softwood Plywood: APA A-B EXT-Group 1
- 34 D. Fiberboard: Medium density complying with ANSI A208.2
- 35 E. Fasteners and Anchorages: Provide all nails, screws, bolts, nuts, washers, and other anchoring devices of
36 the type, size, material, and finish required for application indicated to provide secure attachment,
37 concealed where possible, and complying with applicable Federal Specifications.

1 F. Miscellaneous lumber for blocking, furring, cabinet bases: Provide materials and comply with provisions
2 as specified in Section 06100.

3 2.2 MODULAR LAMINATE CLAD ARCHITECTURAL CABINETS

4 A. Quality Standards: Comply with AWI Section 1600 "Modular Cabinets" and as specified herein.

- 5 1. Type of Cabinet Construction: Flush overlay.
6 2. Core Material: ANSI A208.1, Type M-3 particleboard.

7 B. Laminate Cladding: High pressure decorative laminate complying with NEMA LD3 and as follows:

- 8 1. Exposed Surfaces (other than edges): HPL VGP (0.027 inch nominal thickness)
9 2. Semi-exposed Surfaces (other than edges): Decorative surface of thermally fused polyester or
10 melamine laminated to core under pressure and complying with NEMA LD3 GP28 and LD3
11 CL20 standards. Vinyl overlays not acceptable. Painted material not acceptable.
12 3. Exposed Edges of Laminated Components:
13 a. Body Members and Shelves: HPL to match exposed faces
14 b. Doors and drawers: HPL to match exposed faces.
15 4. Concealed Laminate: Where balancing sheet is indicated or required by referenced quality
16 standards, provide backer type laminate, grade designation BK-20 (0.020 inch nominal thickness)
17 complying with NEMA LD3 CL20 standards.

18 2.3 CUSTOM LAMINATE CLAD ARCHITECTURAL CABINETS

19 A. Quality Standards: Comply with AWI Section 400 "Architectural Cabinets" and Section 400B "Laminate
20 Cabinets"

- 21 1. Grade: Custom
22 2. Type of Cabinet Construction: Flush overlay.
23 3. Core Material: ANSI A208.1, Type M-3 particleboard.

24 B. Laminate Cladding: High pressure decorative laminate complying with NEMA LD3 and as follows:

- 25 1. Exposed Surfaces:
26 a. Horizontal Surfaces: HGS (0.048 inch nominal thickness)
27 b. Postformed Surfaces: HGP (0.039 inch nominal thickness)
28 c. Vertical Surfaces: HPL VGP (0.027 inch nominal thickness)
29 2. Semi-exposed Surfaces (other than edges): Decorative surface of thermally fused polyester or
30 melamine laminated to core under pressure and complying with NEMA LD3 GP28 and LD3
31 CL20 standards. Vinyl overlays not acceptable. Painted material not acceptable.
32 3. Exposed Edges of Laminated Components:
33 a. Body Members and Shelves: HPL to match exposed faces
34 b. Doors and drawers: HPL to match exposed faces.
35 4. Concealed Laminate: Where balancing sheet is indicated or required by referenced quality
36 standards, provide backer type laminate, grade designation BK-20 (0.020 inch nominal thickness)
37 complying with NEMA LD3 CL20 standards.

38 2.4 THICKNESS AND MATERIALS FOR LAMINATE CLAD CABINET COMPONENTS:

39

40	<u>COMPONENT</u>	<u>MATERIAL</u>	<u>MIN. THICKNESS</u>
41	Body Member	Panels	3/4 inch
42			
43	Rails	Solid Lumber or Panel	3/4 inch
44			

1	Shelves	Panels	3/4 inch(span up to 32 inch)
2		(Medium density particle or fiberboard)	5/4 inch (span up to 42 inch)
3			
4	Backs	Panels	3/8 inch
5			
6	Drawer Sides,	Solid Lumber or Particleboard Panel	1/2 inch Lumber
7	Backs, Subfronts		1/2 inch (50# density or more)
8			
9	Drawer Bottoms	Panels	3/8 inch
10			
11	Drawer Fronts	Panels	3/4 inch
12			
13	Doors	Panels	3/4 inch(up to 30 inch by 80 inch)
14			1 inch (over 30 inch by 80 inch)

15 A. Provide materials and products that result in colors and textures of exposed laminate surfaces complying
16 with the following requirements:

- 17 1. Manufacturer: Pionite
- 18 2. Pattern: AG331-S
- 19 3. Color: Stonedust Crepe

20 2.5 PLASTIC-LAMINATE COUNTERTOPS

21 A. Quality Standards: Comply with AWI Section 400 “Architectural Cabinets” and Section 400C
22 “Countertops”

23 B. Laminate Clad Tops:
24 1. Grade: Custom
25 2. Core Material: ANSI A208.1, Type 2-M-2 particleboard (1 inch thick, unless otherwise indicated
26 on Drawings). Provide blancing shee (BK-20) on all tops, and on all surfaces of window stools
27 which do not have high pressure decorative laminate.

28 C. Laminate Cladding: High Pressure decorative laminate complying with NEMA LD3 and as follows:
29 1. Provide materials and products that result in colors and textures of exposed laminate surfaces
30 complying with the following requirements:
31 a. Manufacturer: Pionite
32 b. Pattern: MB0601-S
33 c. Color: Vermont Granite
34 2. Horizontal Surfaces: HGS (0.048 inch nominal thickness)
35 3. Postformed Surfaces: HGP (0.039 inch nominal thickness)
36 4. Edge Treatment:
37 a. General: Same as laminate cladding on horizontal surfaces.
38 b. Transaction Counter: Red oak, clear, plain sawn.

39 2.6 CABINET HARDWARE AND ACCESSORIES

40 A. Manufacturer’s specified below to indicate quality and function. Other manufacturer’s equivalent
41 products may be used.
42 1. Drawer Slides: Accuride 7432; except Accuride 3640 Series for drawers over 24 inches wide.
43 2. Pulls: Stanley 4484 (26D)
44 3. Hinges: Grass 3903 Series, self-closing, number of hinges per door as follows:
45 a. 2 per door up to 24 inches wide by 35-1/2 inches high

- 1 b. 3 per door up to 24 inches wide by 63 inches high
- 2 c. 4 per door up to 24 inches wide by 78-3/4 inches high
- 3 d. 5 per door up to 24 inches wide by 94-1/2 inches high
- 4 4. Shelf Support: Double pin design with anti-tip shelf restraints, equivalent to Bainbridge Manufacturing 3220CL. Phone (800)255-4702.
- 5
- 6 5. Catches: Stanley SP41
- 7 6. Locks: KV986NP (each lock keyed alike by room and master keyed)
- 8 7. Closet Rod: KV770-5 CHR with KV 764/766 CHR flanges
- 9 8. Shelf Standards: KV87 ANO
- 10 9. Shelf Brackets: KV187LL ANO
- 11 10. Label Holder: 3 inch by 3/4 inch card holder at each opening on mailboxes; Finish: to be determined by Owner.
- 12

13 B. Back-Mounted Wire Pulls: BHMA A156.9, B02011. 4 inch centers.

14 C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

- 15
- 16 1. Satin Stainless Steel: BHMA 630.

17 2.7 MISCELLANEOUS MATERIALS

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

20 B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

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

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

- 26 1. Wood Glues: 30 g/L.
- 27 2. Contact Adhesive: 250 g/L.
- 28

29 E. Adhesive for Bonding Plastic Laminate: Water based contact cement, white glue PVA.

- 30 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

31 2.8 FABRICATION

32 A. General:

- 33 1. Fabricate architectural woodwork to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items and work.
- 34
- 35 2. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- 36
- 37
- 38

39 B. Precut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately from on-site dimensions and use templates or roughing-in diagrams for proper size and shape. Smooth

1 edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a
2 water-resistant coating.

3 C. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other
4 construction, obtain field measurements and verify dimensions and shop drawing details as required for
5 accurate fit.

6 2.9 JOINERY AND FASTENING OF CASE BODY MEMBERS

7 A. Fixed case body members (shelves, bottoms, tops and rails which are fastened to sides, ends and dividers)
8 shall be joined using concealed dado, or dowel matched or interlocking mechanical fasteners. Where the
9 concealed dado and dowel methods are employed, cases shall be assembled utilizing glue and pressure.
10 The dad method must be reinforced with blind nailing or screwing.

11 B. No nails, screws or other fastenings may be visible on exposed surfaces. On semi- exposed surfaces,
12 mechanical fasteners may be visible.

13 C. Rails or top panels must be provided where case will have separate top in order to permit concealed
14 fastening of the separate top through such rails.

15 D. Where not in violation of design, surfaces of intersecting body members may be set back not exceed 1/8
16 inch, provided setback is constant.

17 2.10 PREPERATION FOR FINISHING

18 A. Shop Finishing: Set exposed nails and screws. Apply wood filler in exposed nail and screw. Comply
19 with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces,
20 and similar preparations for finishing architectural woodwork edge treatment, as applicable to each uti of
21 work.

22 B. General:

- 23 1. Comply with AWI Section 1500, unless otherwise indicated. Provide finishes of same grades as
24 items to be finished.
- 25 2. Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final
26 touchup, cleaning and polishing until after installation.

27 C. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of
28 woodwork. Apply 2 coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-
29 laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper,
30 or thermoset decorative overlay.

31 D. Finish System:

- 32 1. Wood Edge treatment: AWI Finish System TR04: Conversion varnish, satin.

33 PART 3 - EXECUTION

34 3.1 General:

35 A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

1 3.2 Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in
2 PART 2 of this section for type of woodwork involved.

3 3.3 INSTALLATION

4 A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for
5 fabrication of type of woodwork involved.

6 B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication
7 in Part 2, to extent that it was not completed in the shop.

8 C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level
9 and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

10 D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

11 E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with
12 countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine
13 finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and
14 matching final finish if transparent finish is indicated.

15 F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately
16 aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered
17 operation. Complete installation of hardware and accessory items as indicated.

18 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other
19 variation from a straight line.

20 2. Maintain veneer sequence matching of cabinets with transparent finish.

21 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400
22 mm) o.c..

23 G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into
24 underside of countertop.

25 1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other
26 variation from a straight line.

27 2. Secure backsplashes to walls with adhesive.

28 3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint
29 Sealants."

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

32 3.4 ADJUSTING AND CLEANING

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

35 B. Clean, lubricate, and adjust hardware.

36 C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore
37 damaged or soiled areas.

38 END OF SECTION 06410

1 SECTION 072100 - BUILDING INSULATION

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Section Includes:

- 8 1. Glass-fiber blanket sound control insulation.

9 1.3 SUBMITTALS

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

- 11 1. For products having recycled content, documentation indicating percentages by weight of
12 postconsumer and preconsumer recycled content.
13 2. Documentation indicating formaldehyde free manufacturing.

- 14 B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing
15 agency, for each product.

16 1.4 QUALITY ASSURANCE

- 17 A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84
18 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

19 1.5 DELIVERY, STORAGE, AND HANDLING

- 20 A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and
21 other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for
22 handling, storing, and protecting during installation.

23 **PART 2 - PRODUCTS**

24 2.1 GLASS-FIBER BLANKET SOUND CONTROL INSULATION

- 25 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 26 1. CertainTeed Corporation.
27 2. Johns Manville.
28 3. Owens Corning.

- 29 B. UnFaced, Glass-Fiber Blanket Insulation: ASTM C 665
- 30 C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
- 31 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no
32 formaldehyde.
- 33 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-
34 ppm formaldehyde.
- 35 D. Products:
- 36 1. CertainTeed Corp:
- 37 a. Batts. 30% recycled content, some from curbside recycling. Batts with polypropylene wrap
38 to contain any particulates. Available in standard unfaced or faced. InsulSafe contain no
39 toxic binders.
- 40 2. Johns Manville:
- 41 a. Fiberglass blankets, batts. Formaldehyde-free, low-emission Grid-SHIELD Rx batts and
42 rolls. Perforated polyethylene wrapped. 20% to 30% recycled glass. SCS Certified and
43 Environmental Choice Program. R-1 1 to R-25 batts.
- 44 3. Owens-Corning:
- 45 a. Non-offgassing, less toxic fiberglass in rolls rated R-13 and R-25. Rolls and batts. 30%
46 recycled glass, some from curbside pickup. SCS certified.

47 PART 3 - EXECUTION

48 3.1 INSTALLATION, GENERAL

- 49 A. Comply with insulation manufacturer's written instructions applicable to products and applications
50 indicated.
- 51 B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or
52 snow at any time.
- 53 C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill
54 voids with insulation. Remove projections that interfere with placement.
- 55 D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths,
56 and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers
57 are otherwise shown or required to make up total thickness.

58 3.2 INSTALLATION OF INSULATION

- 59 A. Apply insulation units to substrates by method indicated, complying with manufacturer's written
60 instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical
61 anchorage to provide permanent placement and support of units.
- 62 B. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following
63 requirements:
- 64 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than
65 one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

- 66 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of
67 insulation and adjoining framing members.
68 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or
69 protected from contact with insulation.
70 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced
71 blankets mechanically and support faced blankets by taping flanges of insulation to flanges of
72 metal studs.

73 END OF SECTION 072100

1 SECTION 078410 - THROUGH-PENETRATION FIRESTOP SYSTEMS

2 PART 1 - GENERAL

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Section Includes:

- 8 1. Penetrations in fire-resistance-horizontal and vertical assemblies.

9 1.3 SUBMITTALS

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

- 11 1. For penetration firestopping, including printed statement of VOC content and chemical
12 components.

13 1.4 QUALITY ASSURANCE

- 14 A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991,
15 "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified
16 Firestop Contractor Program Requirements."

- 17 B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material,
18 design, and extent to that indicated for this Project, whose work has resulted in construction with a record
19 of successful performance. Qualifications include having the necessary experience, staff, and training to
20 install manufacturer's products per specified requirements. Manufacturer's willingness to sell its
21 penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself
22 confer qualification on buyer.

- 23 C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following
24 requirements:

- 25 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities
26 having jurisdiction.

- 27 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration
28 Firestopping" Article. Provide rated systems complying with the following requirements:

- 29 a. Penetration firestopping products bear classification marking of qualified testing and
30 inspecting agency.

- 31 b. Classification markings on penetration firestopping correspond to designations listed by the
32 following:

- 33 1) UL in its "Fire Resistance Directory."

- 1 1.5 PROJECT CONDITIONS
- 2 A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate
3 temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates
4 are wet because of rain, frost, condensation, or other causes.
- 5 B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of
6 ventilations or, where this is inadequate, forced-air circulation.

7 1.6 COORDINATION

- 8 A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is
9 installed according to specified requirements.
- 10 B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration
11 firestopping.
- 12 C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations;
13 confirm dates and times on day preceding each series of installations.

14 PART 2 - PRODUCTS

15 2.1 PENETRATION FIRESTOPPING

- 16 A. Provide penetration firestopping that is produced and installed to resist spread of fire according to
17 requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance
18 rating of construction penetrated. Penetration firestopping systems shall be compatible with one another,
19 with the substrates forming openings, and with penetrating items if any.
- 20 B. Fire Rated Construction Design Requirements: Maintain barrier and structural floor fire resistance
21 ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of
22 construction, at separations required to permit building movement and sound or vibration absorption, and
23 at other construction gaps.
24 1. Latex and acrylic based sealants are not acceptable. Use only urethanes or silicone base materials.
- 25 C. Smoke Barrier Construction Design Requirements: Maintain barrier and structural floor resistance to
26 cold smoke at all penetrations, connections with other surfaces and types of construction and at all
27 separations required to permit building movement and sound or vibration absorption, and at other
28 construction gaps.
- 29 D. Assembly designs are specified generally under UL system categories by penetrating item.
30 Manufacturers' product applications must have specific UL system designations.

Penetrating Item	Concrete	Gypsum	Wood
Plastic Pipe	CAJ2000	WL2000	FC2000
	FA2000		
Metal Pipe	CAJ1000	WL1000	FC1000
	WJ1000		
Insulated Metal Pipe	FA1000		
	CAJ5000	WL5000	FC5000
Insulated Cable	CBJ5000		
	FA5000		
Insulated Cable	CAJ2000	WL2000	
	CAJ3000	WL3000	FC3000

1		CBJ3000	
2		FA3000	
3	Cable Tray	CAJ4000	WL4000
4		CBJ4000	
5	Busway	CAJ6000	
6		FA6000	
7	Glass Pipe	CAJ2000	WL2000
8	Blank	CAJ0000	
9		CBJ0000	
10		FA0000	
11	Construction Gap	FF-S-1000	
12		WW-S-1000	
13		W-S-1000	
14	Mixed Penetrating Items	CAJ8000	WL8000
15		CBJ8000	
16		FA8000	
17	Misc. Mechanical	CAJ7000	
18	(Vent Ducts)		

19 E. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content
20 when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

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

24 F. Accessories: Provide components for each penetration firestopping system that are needed to install fill
25 materials and to maintain ratings required. Use only those components specified by penetration
26 firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping
27 indicated.

28 PART 3 - EXECUTION

29 3.1 EXAMINATION

- 30 A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening
31 configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- 32 B. Proceed with installation only after unsatisfactory conditions have been corrected.

33 3.2 PREPARATION

- 34 A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply
35 with manufacturer's written instructions and with the following requirements:
 - 36 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that
37 could interfere with adhesion of penetration firestopping.
 - 38 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of
39 developing optimum bond with penetration firestopping. Remove loose particles remaining from
40 cleaning operation.
 - 41 3. Remove laitance and form-release agents from concrete.

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

4 3.3 INSTALLATION

5 A. General: Install penetration firestopping to comply with manufacturer's written installation instructions
6 and published drawings for products and applications indicated.

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

10 3.4 IDENTIFICATION

11 A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to
12 surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone
13 seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type
14 labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed.
15 Include the following information on labels:

- 16 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management
17 of Any Damage."
- 18 2. Contractor's name, address, and phone number.
- 19 3. Designation of applicable testing and inspecting agency.
- 20 4. Date of installation.
- 21 5. Manufacturer's name.
- 22 6. Installer's name.

23 3.5 CLEANING AND PROTECTION

24 A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning
25 materials that are approved in writing by penetration firestopping manufacturers and that do not damage
26 materials in which openings occur.

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

32 END OF SECTION 078410

1 SECTION 079200 - JOINT SEALANTS

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Section Includes:

- 8 1. Elastomeric joint sealants.
9 2. Latex joint sealants.
10 3. Acoustical joint sealants.

- 11 B. Related Sections:

- 12 1. Division 9 Section "Gypsum Board" for sealing perimeter joints.
13 2. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with
14 acoustical sealants.

15 1.3 SUBMITTALS

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

- 17 1. For sealants and sealant primers used inside the weatherproofing system, including printed
18 statement of VOC content.

- 19 B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing
20 agency, indicating that sealants comply with requirements.

- 21 C. Samples: Submit manufacturer's color chart of not less than 30 colors for initial selection purposes.
22 Upon request, submit cured strip samples of actual product of each color selected by A/E.

- 23 D. Warranties: Sample of special warranties.

24 1.4 QUALITY ASSURANCE

- 25 A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for
26 installation of units required for this Project.

- 27 B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

28 1.5 PROJECT CONDITIONS

- 29 A. Do not proceed with installation of joint sealants under the following conditions:

- 1 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant
2 manufacturer.
- 3 2. When joint substrates are wet.
- 4 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications
5 indicated.
- 6 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint
7 substrates.

8 1.6 WARRANTY

9 A. Special warranties specified in this article exclude deterioration or failure of joint sealants from the
10 following:

- 11 1. Movement of the structure caused by structural settlement or errors attributable to design or
12 construction resulting in stresses on the sealant exceeding sealant manufacturer's written
13 specifications for sealant elongation and compression.
- 14 2. Disintegration of joint substrates from natural causes exceeding design specifications.
- 15 3. Mechanical damage caused by individuals, tools, or other outside agents.
- 16 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

17 1.7 DELIVERY, STORAGE, AND HANDLING

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

21 B. Store and handle material to prevent their deterioration or damage due to moisture, temperature changes,
22 contaminants, or other causes.

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

25 1.8 PROJECT/SITE CONDITIONS

26 A. Examine Drawings and verify that all joints are properly detailed and proportioned for expansion and/or
27 control as recommended in writing by the sealant manufacturer. Immediately notify A/E of any deviation.

28 **PART 2 - PRODUCTS**

29 2.1 MATERIALS, GENERAL

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

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

36 1. Architectural Sealants: 250 g/L.

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

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

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

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

- 11 F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

12 2.2 ELASTOMERIC JOINT SEALANTS

- 13 A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of
- 14 base polymer indicated which complies with ASTM C 920 requirements, including those referenced for
- 15 Type, Grade, Class, and Uses.
- 16 1. Type-1: Multi-part nonsag urethane sealant, Type M, Grade NS, Class 25, Uses NT, M, A, and as
- 17 applicable to joint substrates indicated, O. Equivalent to Tremco DyMeric 240FC.
- 18 2. Type-2: Multi-part pourable urethane sealant, Type M, Grade P, Class 25, Uses NT, M, A, and as
- 19 applicable to joint substrates indicated, O. Equivalent to Tremco THC-900/901.

20 2.3 LATEX JOINT SEALANTS

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

- 22 1. Products: Subject to compliance with requirements, provide the following:
- 23 a. Bostik, Inc.; Chem-Calk 600.
- 24 b. Pecora Corporation; AC-20+.
- 25 c. Tremco Incorporated; Tremflex 834.

26 2.4 ACOUSTICAL JOINT SEALANTS

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

- 31 1. Products: Subject to compliance with requirements, provide the following:
- 32 a. Pecora Corporation; AC-20 FTR.
- 33 b. USG Corporation; SHEETROCK Acoustical Sealant.

34 2.5 JOINT SEALANT BACKING

- 1 A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates,
2 sealants, primers, and other joint fillers; and are approved for applications indicated by sealant
3 manufacturer based on field experience and laboratory testing.
- 4 B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O
5 (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as
6 approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density
7 to control sealant depth and otherwise contribute to producing optimum sealant performance.
- 8 C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for
9 preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint.
10 Provide self-adhesive tape where applicable.

11 2.6 MISCELLANEOUS MATERIALS

- 12 A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to
13 joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- 14 B. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent
15 to joints.
- 16 C. Cleaners for Non Porous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable
17 to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and
18 adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect
19 on sealant adhesion or in-service performance.

20 **PART 3 - EXECUTION**

21 3.1 EXAMINATION

- 22 A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with
23 requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant
24 performance.
- 25 B. Proceed with installation only after unsatisfactory conditions have been corrected.

26 3.2 PREPARATION

- 27 A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with
28 joint-sealant manufacturer's written instructions and the following requirements:
 - 29 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint
30 sealant, including dust, paints (except for permanent, protective coatings tested and approved for
31 sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease,
32 waterproofing, water repellents, water, surface dirt, and frost.
 - 33 a. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a
34 combination of these methods to produce a clean, sound substrate capable of developing
35 optimum bond with joint sealants. Remove loose particles remaining after cleaning
36 operations above by vacuuming or blowing out joints with oil-free compressed air.

1 B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated
2 by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-
3 sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow
4 spillage or migration onto adjoining surfaces.

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

8 3.3 INSTALLATION OF JOINT SEALANTS

9 A. General: Comply with joint-sealant manufacturer's written installation instructions for products and
10 applications indicated, unless more stringent requirements apply.

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

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

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

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

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

- 24 1. Place sealants so they directly contact and fully wet joint substrates.
- 25 2. Completely fill recesses in each joint configuration.
- 26 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum
27 sealant movement capability.

28 F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins,
29 tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads
30 of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with
31 sides of joint.

- 32 1. Remove excess sealant from surfaces adjacent to joints.
- 33 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor
34 sealants or adjacent surfaces.

35 G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction
36 at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical
37 sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations.
38 Comply with ASTM C 919 and with manufacturer's written recommendations.

39 3.4 CLEANING

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

4 3.5 PROTECTION

5 A. Protect joint sealants during and after curing period from contact with contaminating substances and from
6 damage resulting from construction operations or other causes so sealants are without deterioration or
7 damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs,
8 cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired
9 areas are indistinguishable from original work.

10 3.6 JOINT-SEALANT SCHEDULE

11 A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

12 1. Joint Locations:

- 13 a. Vertical joints on exposed surfaces of partitions.
14 b. Perimeter joints between interior wall surfaces and frames of interior doors.

15 2. Joint Sealant: Latex.

16 B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic
17 surfaces.

18 1. Joint Sealant Location:

- 19 a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

20 C. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

21 1. Joint Location:

- 22 a. Acoustical joints where indicated.

23 2. Joint Sealant: Acoustical.

24 END OF SECTION 079200

1 SECTION 081100 - STEEL FRAMES

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Section Includes:

8 1. Standard hollow metal frames.

- 9 B. Related Sections:

- 10 1. Division 8 Section "Flush Wood Doors" for doors installed in hollow metal frames.
11 2. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
12 3. Division 9 Sections "Interior Painting" for field painting hollow metal doors and frames.

13 1.3 DEFINITIONS

- 14 A. Minimum Thickness: Minimum thickness of base metal without coatings.

- 15 B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

16 1.4 SUBMITTALS

- 17 A. Product Data: Submit manufacturer's technical data substantiating that products comply with
18 requirements.

- 19 B. Shop Drawings: Submit for fabrication and installation of steel frames. Include details of each frame
20 type, conditions at openings, details of constructions, and details of joints and connections. Provide full-
21 size details of cutout stops. Show anchorage and accessory items.

- 22 C. Schedule: Submit schedule of frames using same reference numbers for details and openings as those on
23 the Drawings.

24 1.5 QUALITY ASSURANCE

- 25 A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

26 1.6 DELIVERY, STORAGE, AND HANDLING

- 27 A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-
28 site storage. Do not use nonvented plastic.

1 B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs
2 and mullions.

3 C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical
4 position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not
5 store in a manner that traps excess humidity.

6 1.7 PROJECT CONDITIONS

7 A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

8 1.8 COORDINATION

9 A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and
10 directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with
11 integral anchors. Deliver such items to Project site in time for installation.

12 **PART 2 - PRODUCTS**

13 2.1 MATERIALS

14 A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed
15 applications.

16 B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum
17 G60 (Z180) or A60 (ZF180) metallic coating.

18 C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill
19 phosphatized.

20 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or
21 ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

22 D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

23 E. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers
24 manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with
25 maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing
26 ASTM E 136 for combustion characteristics.

27 2.2 STANDARD HOLLOW METAL FRAMES

28 A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

29 B. Interior Frames: Fabricated from cold-rolled steel sheet with metallic-coated sheet required at insulated
30 doors frames.

- 31 1. Fabricate frames with mitered or coped corners.
32 2. Fabricate frames as full profile welded unless otherwise indicated.
33 3. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

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

3 2.3 FRAME ANCHORS

4 A. Jamb Anchors:

5 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0
6 mm) thick.

7 2.4 STOPS AND MOLDINGS

8 A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high
9 unless otherwise indicated.

10 2.5 FABRICATION

11 A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to
12 required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and
13 assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work
14 that cannot be permanently factory assembled before shipment.

15 B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

16 C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations,
17 provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

18 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush,
19 and invisible.

20 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless
21 otherwise indicated.

22 3. Jamb Anchors: Provide number and spacing of anchors as follows:

23 a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom
24 of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

25 1) Three anchors per jamb up to 60 inches (1524 mm) high.

26 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.

27 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.

28 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610
29 mm) or fraction thereof above 96 inches (2438 mm) high.

30 5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in
31 metal-stud partitions.

32 4. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows.
33 Keep holes clear during construction.

34 a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

35 b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

36 D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled
37 steel sheet.

1 E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware;
2 include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule
3 and templates furnished as specified in Division 8 Section "Door Hardware."

- 4 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
- 5 2. Reinforce frames to receive nontemplated, mortised and surface-mounted door hardware.
- 6 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series
7 specifications for preparation of hollow metal work for hardware.
- 8 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16
9 Sections.

10 F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of
11 stops and moldings with butted or mitered hairline joints.

- 12 1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and
13 frames.
- 14 2. Provide loose stops and moldings on inside of hollow metal work.
- 15 3. Coordinate rabbet width between fixed and removable stops with type of glazing and type of
16 installation indicated.

17 2.6 STEEL FINISHES

18 A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

- 19 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying
20 with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate;
21 compatible with substrate and field-applied coatings despite prolonged exposure.

22 **PART 3 - EXECUTION**

23 3.1 EXAMINATION

- 24 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for
25 installation tolerances and other conditions affecting performance of the Work.
- 26 B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame
27 installation.
- 28 C. Proceed with installation only after unsatisfactory conditions have been corrected.

29 3.2 PREPARATION

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

32 3.3 INSTALLATION

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

- 1 B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with
2 ANSI/SDI A250.11.
- 3 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors
4 are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth
5 and undamaged.
- 6 a. Where frames are fabricated in sections because of shipping or handling limitations, field
7 splice at approved locations by welding face joint continuously; grind, fill, dress, and make
8 splice smooth, flush, and invisible on exposed faces.
- 9 b. Install frames with removable glazing stops located on secure side of opening.
- 10 c. Remove temporary braces necessary for installation only after frames have been properly
11 set and secured.
- 12 d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as
13 necessary to comply with installation tolerances.
- 14 2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
- 15 3. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and
16 plumb to the following tolerances:
- 17 a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90
18 degrees from jamb perpendicular to frame head.
- 19 b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line
20 parallel to plane of wall.
- 21 c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on
22 parallel lines, and perpendicular to plane of wall.
- 23 d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- 24 C. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal
25 manufacturer's written instructions.
- 26 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than
27 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

28 3.4 ADJUSTING AND CLEANING

- 29 A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat
30 and apply touchup of compatible air-drying, rust-inhibitive primer.

31 END OF SECTION 081100

1 SECTION 082100 - WOOD DOORS

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Section Includes:

- 8 1. Solid-core doors with wood-veneer faces.
9 2. Factory finishing flush wood doors.
10 3. Factory fitting flush wood doors to frames and factory machining for hardware.

- 11 B. Related Sections:

- 12 1. Division 8 Section "Steel Doors and Frames" for hollow metal frames.
13 2. Division 8 Section "Glazing" for glass view panels in flush wood doors.

14 1.3 SUBMITTALS

- 15 A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for
16 openings. Include factory-finishing specifications.

- 17 1. Chain-of-custody certificates certifying that flush wood doors comply with forest certification
18 requirements. Include evidence that manufacturer is certified for chain of custody by a third party
19 certification body.

- 20 2. For adhesives and composite wood products, documentation indicating that product contains no
21 urea formaldehyde.

- 22 B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door;
23 construction details not covered in Product Data; location and extent of hardware blocking; and other
24 pertinent data.

- 25 1. Indicate dimensions and locations of mortises and holes for hardware.
26 2. Indicate dimensions and locations of cutouts.
27 3. Indicate requirements for veneer matching.
28 4. Indicate doors to be factory finished and finish requirements.

- 29 C. Samples for Verification:

- 30 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250
31 mm), for each material and finish.

- 32 D. Warranty: Sample of special warranty.

- 1 1.4 QUALITY ASSURANCE
- 2 A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-
3 accredited certification body.
- 4 B. Source Limitations: Obtain flush wood doors and wood paneling from single manufacturer.
- 5 C. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural
6 Wood Flush Doors."
- 7 D. Forest Certification: Provide doors made with cores not less than 70 percent of wood products obtained
8 from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC
9 Principles and Criteria for Forest Stewardship."

10 1.5 DELIVERY, STORAGE, AND HANDLING

- 11 A. Comply with requirements of referenced standard and manufacturer's written instructions.
- 12 B. Package doors individually in plastic bags or cardboard cartons.
- 13 C. Mark each door on bottom rail with opening number used on Shop Drawings.

14 1.6 PROJECT CONDITIONS

- 15 A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight,
16 wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature
17 between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the
18 remainder of the construction period.

19 1.7 WARRANTY

- 20 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors
21 that fail in materials or workmanship within specified warranty period.
- 22 1. Failures include, but are not limited to, the following:
- 23 a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-
24 2134-mm) section.
- 25 b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25
26 mm in a 76.2-mm) span.
- 27 2. Warranty shall also include installation and finishing that may be required due to repair or
28 replacement of defective doors.
- 29 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

30 **PART 2 - PRODUCTS**

31 2.1 MANUFACTURERS

- 32 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1 1. Algoma Hardwoods, Inc.:
- 2 2. Marshfield Door Systems, Inc.
- 3 3. VT Industries Inc.

4 2.2 DOOR CONSTRUCTION, GENERAL

- 5 A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not
- 6 contain urea formaldehyde.
- 7 B. WDMA I.S.1-A Performance Grade: Standard Duty.

8 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

9 A. Interior Solid-Core Doors :

- 10 1. Grade: Premium, with Grade AA faces.
- 11 2. Species: To Match Existing.
- 12 3. Cut: Plain sliced (flat sliced).
- 13 4. Match between Veneer Leaves: Book match.
- 14 5. Assembly of Veneer Leaves on Door Faces: Balance match.
- 15 6. Room Match: Provide door faces of compatible color and grain within each separate room or area
- 16 of building.
- 17 7. Exposed Vertical Edges: Applied wood-veneer edges of same species as faces and covering edges
- 18 of faces.
- 19 8. Core: Glued wood stave.
- 20 9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed
- 21 before veneering. Faces are bonded to core using a hot press.

22 2.4 FABRICATION

- 23 A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of
- 24 referenced quality standard for fitting unless otherwise indicated.
- 25 B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-
- 26 WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series
- 27 standards, and hardware templates.
- 28 C. Openings: Cut and trim openings through doors in factory as indicated or scheduled.
- 29 1. Light Openings: Trim openings with moldings of material and profile indicated.
- 30 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable
- 31 requirements in Division 8 Section "Glazing."

32 2.5 FACTORY FINISHING

- 33 A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including
- 34 fitting doors for openings and machining for hardware that is not surface applied, before finishing.
- 35 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted
- 36 on top and bottom edges, edges of cutouts, and mortises.

- 1 B. Finish doors at factory.
- 2 C. Transparent Finish: Match existing doors.
 - 3 1. Grade: Premium.
 - 4 2. Finish: WDMA TR-6 catalyzed polyurethane.
 - 5 3. Staining: Match existing.
 - 6 4. Effect: Match existing.
 - 7 5. Sheen: Match existing.

8 **PART 3 - EXECUTION**

9 3.1 EXAMINATION

- 10 A. Examine doors and installed door frames before hanging doors.
 - 11 1. Verify that frames comply with indicated requirements for type, size, location, and swing
 - 12 characteristics and have been installed with level heads and plumb jambs.
 - 13 2. Reject doors with defects.
- 14 B. Proceed with installation only after unsatisfactory conditions have been corrected.

15 3.2 INSTALLATION

- 16 A. Hardware: For installation, see Division 8 Section "Door Hardware."
- 17 B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the
- 18 referenced quality standard, and as indicated.
- 19 C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- 20 D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project
- 21 site.

22 3.3 ADJUSTING

- 23 A. Operation: Rehang or replace doors that do not swing or operate freely.
- 24 B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be
- 25 repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

26 END OF SECTION 082100

1 SECTION 087100 - DOOR HARDWARE

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes the following:

- 8 1. Commercial door hardware for the following:

- 9 a. Swinging doors.
10 b. Other doors to the extent indicated.

- 11 B. Related Sections include the following:

- 12 1. Section 08110: Steel Frames
13 2. Section 08210: Wood Doors

14 1.3 SUBMITTALS

- 15 A. Product Data: Include construction and installation details, material descriptions, dimensions of
16 individual components and profiles, and finishes.

- 17 B. Warranty: Special warranty specified in this Section.

- 18 C. Door Hardware Schedule

- 19 1. Submit to A/E, (4) complete computer generated or typewritten copies of the proposed door
20 hardware schedule for approval. Prepare schedule using the scheduling sequence and vertical
21 format in Door and Hardware Institute's (DHI) "Sequence and Format for the Hardware
22 Schedule". Do not order hardware until schedule has been reviewed positive by A/E.
23 2. When submitting schedules for approval, include 2 manufacturer's cut sheets on each hardware
24 item proposed. Index with the use of numbers or letter or a combination of both, with the
25 hardware schedule. The index numbers/letters are to be in the right hand column on the same line
26 as the respective manufacturer's numbers. All manufacturers' numbers shall be indexed even
27 when appearing more than once.

- 28 D. Keying Schedule: Submit a separate keying schedule

- 29 E. Samples: Upon request, provide to A/E one sample of each item of door hardware that is to be furnished
30 for this project. Sample need not be of specified finish unless requested by A/E. Samples will be
31 returned to contractor upon completion of Project.

- 32 F. ANSI: Upon request by A/E, provide hardware manufactures' letters of compliance that their products
33 meet specified ANSI standards and that they have been tested and meet grades specified.

1 G. Templates: Provide templates and/or physical hardware to all trades requiring them in order they may
2 cut, reinforce or otherwise prepare their material or product to receive the hardware item. If physical
3 hardware is required by any manufacturer, ship to them such hardware via prepaid freight in sufficient
4 time to prevent any delay in the execution of their work.

5 1.4 QUALITY ASSURANCE

6 A. General:

- 7 1. Hardware has been specified by manufacturer's name, brand, and catalog numbers for the purpose
8 of establishing a basis for quality, finish, design, and operational function.
9 2. Hardware shall be substantially manufactured in the United States of America as defined in
10 Wisconsin Statutes.

11 B. Supplier Qualifications: Supplier furnishing hardware in the vicinity for a period of not less than 5 years.
12 This supplier shall have experience in the preparation of architectural hardware specifications, estimating,
13 detailing, ordering, servicing of architectural hardware in all its branches and will be available at
14 reasonable times during the course of the work for project hardware consultation to the Owner, A/E, and
15 GC.

16 C. Supplier's principal office shall be located within a 100 mile radius of the Project Site.

17 D. Keying Meeting:

- 18 1. Consult with Owner and prepare a detailed keying schedule.
19 2. Key meeting to be attended by the Owner and Hardware supplier. Notify A/E of time and date at
20 least 7 days before meeting.

21 1.5 COORDINATION

22 A. Existing Openings: Where new hardware components are scheduled for application to existing
23 construction or where modifications to existing door hardware are required, field verify existing
24 conditions and coordinate installation of door hardware to suit opening conditions and to provide for
25 proper operation.

26 1.6 DELIVERY, STORAGE, AND HANDLING

27 A. Package all items of hardware to be delivered to the job site. Package, arrange, and label in a manner
28 acceptable to GC. Include all necessary screws, bolts, miscellaneous parts, instructions and where
29 necessary installation templates for manufacturer's suggested installation. **Do not include miscellaneous**
30 **parts and accessories not specified nor intended to be used on the Project.** Clearly label to
31 conveniently identify them and their intended location in the building. Use A/E door schedule mark
32 where applicable.

33 B. The GC or contractor of his choice will receive the hardware when delivered at the job site. A dry locked
34 storage space complete with shelving, will be provided for the purpose of unpacking, sorting out,
35 checking and storage.

36 C. Deliver door hardware to and jointly inventory with GC. Direct factory shipments to the job site not
37 acceptable. Promptly replace items damaged in shipment with proper material without additional cost.

38 D. Handle hardware in a manner to minimize marring, scratching, or damage.

1 1.7 OWNERS INSTRUCTIONS

2 A. Upon completion of hardware installation, assist the GC in instructing Owner in function, operation, and
3 maintenance of all hardware and other work of this Section. Include demonstration of electrically
4 controlled hardware devices.

5 1.8 WARRANTY

6 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
7 components of door hardware that fail in materials or workmanship within specified warranty period.

8 1. Failures include, but are not limited to, the following:

- 9 a. Structural failures including excessive deflection, cracking, or breakage.
- 10 b. Faulty operation of operators and door hardware.
- 11 c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and
12 use.

13 2. Warranty Period: Three years from date of Substantial Completion, except as follows:

- 14 a. Exit Devices: Two years from date of Substantial Completion.
- 15 b. Manual Closers: 10 years from date of Substantial Completion.

16 1.9 EXTRA STOCK/SPARE PARTS

17 A. Furnish and deliver the following items of hardware to the Owner upon Substantial Completion.

- 18 1. Cylinders (cylinder cores): Two master key set; verify keying with Owner.
- 19 2. Locking Devices: Five for each different function.
- 20 3. Closers: One right-hand, one left-hand.

21 **PART 2 - PRODUCTS**

22 2.1 SCHEDULED DOOR HARDWARE

23 A. General: Provide door hardware for each door to comply with requirements in this Section and door
24 hardware sets indicated in door and frame schedule.

25 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated.

26 2.2 HINGES, GENERAL

27 A. Quantity: Provide the following, unless otherwise indicated:

- 28 1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
- 29 2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
- 30 3. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
- 31 4. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every
32 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

- 1 B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood
2 doors and frames, provide only template-produced units.
- 3 C. Hinge Weight: Unless otherwise indicated, provide the following:
4 1. General:
5 a. BB1279 standard weight, 2 ball bearing, brass, with brass pin ANSI A2133.
6 2. Entrance Doors: Heavy-weight hinges.
7 3. Doors with Closers: Antifriction-bearing hinges.
8 4. Interior Doors: Standard-weight hinges.
- 9 D. Hinge Options: Where indicated in door hardware sets or on Drawings:
10 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge
11 pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging
12 corridor doors with locks.
- 13 E. Fasteners: Comply with the following:
14 1. Wood Screws: For wood doors and frames.
15 2. Screws: Phillips flat-head; wood screws for wood doors and frames. Finish screw heads to match
16 surface of hinges.

17 2.3 LOCKS AND LATCHES

- 18 A. General:
19 1. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply
20 with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with
21 Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
22 a. Provide operating devices that do not require tight grasping, pinching, or twisting of the
23 wrist and that operate with a force of not more than 5 lbf (22 N).
24 2. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not
25 require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or
26 special knowledge for operation.
27 3. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved
28 lip extended to protect frame, finished to match door hardware set, and as follows:
29 a. Strikes for Bored Locks and Latches: BHMA A156.2.
30 b. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum
31 framing.
- 32 B. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the
33 following:
34 1. Bored Locks: BHMA A156.2.
35 2. Basis of Design:
36 a. Manufacturer: Best Access
37 b. Series: 9k, with 16 lever and K rose
38 3. Certifications: ANSI A156.2, 1996, Series 4000, Grade 2. UL Listed for all functions up to 3-hour
39 doors.
40 4. Keying: 7-pin tumbler, removable core, with two nickel silver keys per lock.
41 5. Backset: 2-3/4 inches (70 mm). Verify to match existing.
42 6. Strikes: Equivalent to ASA ANSI A115.2 with box.
- 43 C. Miscellaneous Locks and Cylinders:
44 1. Provide miscellaneous lock devices as scheduled.
45 2. Furnish locksets with construction cores, or construction keying.

1 3. Provide power supplies for electronic locks.

2 2.4 EXIT DEVICES

3 A. General:

- 4 1. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are
5 indicated to comply with accessibility requirements, comply with the U.S. Architectural &
6 Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA),
7 Accessibility Guidelines for Buildings and Facilities (ADAAG)."
8 a. Provide operating devices that do not require tight grasping, pinching, or twisting of the
9 wrist and that operate with a force of not more than **5 lbf (22 N)**.
10 2. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require
11 more than **15 lbf (67 N)** to release the latch. Locks shall not require the use of a key, tool, or
12 special knowledge for operation.

13 2.5 CLOSERS

14 A. General

- 15 1. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are
16 indicated to comply with accessibility requirements, comply with the U.S. Architectural &
17 Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA),
18 Accessibility Guidelines for Buildings and Facilities (ADAAG)."
19 a. Comply with the following maximum opening-force requirements:
20 1) Interior, Non-Fire-Rated Hinged Doors: **5 lbf (22.2 N)** applied perpendicular to
21 door.
22 2. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require
23 more than **30 lbf (133 N)** to set door in motion and not more than **15 lbf (67 N)** to open door to
24 minimum required width.
25 3. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations
26 for size of door closers depending on size of door, exposure to weather, and anticipated frequency
27 of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for
28 opening force.

29 B. Surface Closers: BHMA A156.4 , Grade 1 unless Grade 2 is indicated. Provide type of arm required for
30 closer to be located on non-public side of door, unless otherwise indicated.

31 C. Acceptable Manufacturer: LCN or approved equal

- 32 1. Product: 1460 Standard Cover with Parallel Arm/Hold Open "Cush-n-Stop"
33 a. Provide Closers with arms, brackets, drop plates, and other closer accessories to suit the
34 door and frame conditions.

35 2.6 KEYING

36 A. Key lock and lock cores in sets or subsets, and master key as directed by Owner.

37 B. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A.
38 Incorporate decisions made in keying conference, and as follows:

- 39 1. Master Key System: Cylinders are operated by a change key and a master key.
40 2. Existing System: Master key or grand master key locks to Owner's existing system.

41 C. Keys: Nickel silver.

1 1. Stamping: Permanently inscribe each key with a visual key control number and include the
2 following notation:

3 a. Notation: "DO NOT DUPLICATE."

4 2. Quantity: One extra key blank for each lock:

5 2.7 STOPS AND HOLDERS

6 A. Rigid Wall Stops: Polished cast brass, bronze, or aluminum; 3-1/2 inches (89 mm) long, with rubber
7 bumper.

8 B. Wall Bumpers: Polished cast brass or aluminum with rubber bumper; 2-1/2-inch (64-mm) diameter,
9 minimum 3/4-inch (19-mm) projection from wall, with backplate for concealed fastener installation; with
10 convex bumper configuration.

11 C. Rigid Floor Stops: Polished cast brass, bronze, or aluminum, with rubber bumper.

12 D. Dome-Type Floor Stops: Polished cast brass, bronze, or aluminum, with rubber bumper; and as follows:

13 1. Height: Minimum 1 inch (25 mm) high, for doors without threshold, 1-3/8 inches (35 mm) high,
14 for doors with threshold.

15 2.8 PUSH PLATE & DOOR PULLS

16 A. Basis of Design: Brookline #807 pull, finish to match existing.

17 B. Push plates to match existing size and finish.

18 2.9 KICK PLATE

19 A. Size:

20 1. 36" (tall) x 40" (wide)

21 2.10 FLUSH BOLT

22 A. Basis of Design: Rockwood Lever Extension Flush Bolt No.555.

23 2.11 THRESHOLD SEAL

24 A. Basis of Design: Pemko 411_NB Mortised Door Bottom

25 2.12 ELECTRIC STRIKES

26 A. Provide as scheduled with power supplies.

27 2.13 FABRICATION

- 1 A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name
- 2 displayed in a visible location except in conjunction with required fire-rated labels and as otherwise
- 3 approved by Architect.

- 4 1. Manufacturer's identification is permitted on rim of lock cylinders only.

- 5 B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using
- 6 manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality
- 7 equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish
- 8 manufacturer's standard materials or forming methods if different from specified standard.

- 9 C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared
- 10 for machine, wood, and sheet metal screws. Provide screws according to commercially recognized
- 11 industry standards for application intended, except aluminum fasteners are not permitted. Provide
- 12 Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise
- 13 indicated.

- 14 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for
- 15 units already specified with concealed fasteners. Do not use through bolts for installation where
- 16 bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the
- 17 door hardware. Where through bolts are used on hollow door and frame construction, provide
- 18 sleeves for each through bolt.
- 19 2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
- 20 3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended
- 21 Fasteners for Wood Doors."

22 2.14 FINISHES

- 23 A. Standard: BHMA A156.18, as indicated in door hardware sets.
- 24 B. Finish: Satin Chrome 626.
- 25 C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary
- 26 protective covering before shipping.
- 27 D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if
- 28 they are within one-half of the range of approved Samples. Noticeable variations in the same piece are
- 29 not acceptable. Variations in appearance of other components are acceptable if they are within the range
- 30 of approved Samples and are assembled or installed to minimize contrast.

31 **PART 3 - EXECUTION**

32 3.1 EXAMINATION

- 33 A. Examine doors and frames, with Installer present, for compliance with requirements for installation
- 34 tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions
- 35 affecting performance.
- 36 B. Proceed with installation only after unsatisfactory conditions have been corrected.

37 3.2 INSTALLATION

- 1 A. Deliver hardware scheduled or required to be built-in to metal frames to contractors for that work.
- 2 B. Deliver all electronically operated products requiring electrician installation to Division 16 contractor for
3 installation.
- 4 C. General:
- 5 1. Install each hardware item in compliance with the manufacturer's instructions and
6 recommendations. Securely fasten all parts to be attached. Fit faces of mortised parts snug and
7 flush. Make sure all operating parts move freely and smoothly without binding, sticking, or
8 excessive clearance.
- 9 D. Mounting Heights: Mount door hardware units at heights to match existing unless required to comply
10 with governing regulations.
- 11 1. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood
12 Flush Doors."
- 13 E. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and
14 fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in
15 another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing
16 work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been
17 completed on substrates involved.
- 18 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as
19 necessary for proper installation and operation.
- 20 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners
21 and anchors according to industry standards.
- 22 3. Electric Strikes: Install power supplies in ceiling above.
- 23 4. Door Closers: Install surface mounted closers on doors without thru-bolting. Refer to door
24 specifications for door construction. Install for maximum degree of 180 degrees whenever
25 possible, or to adjoining wall. Indicate degree of openings on final hardware schedules.

26 3.3 ADJUSTING AND CLEANING

- 27 A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure
28 proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended.
29 Adjust door control devices to compensate for final operation of heating and ventilating equipment and to
30 comply with referenced accessibility requirements.
- 31 1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period
32 so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a
33 point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- 34 B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's
35 Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each
36 item of door hardware as necessary to ensure function of doors, door hardware, and electrified door
37 hardware.

38 3.4 CLEANING AND PROTECTION

- 39 A. Clean adjacent surfaces soiled by door hardware installation.
- 40 B. Clean operating items as necessary to restore proper function and finish.

1 C. Provide final protection and maintain conditions that ensure that door hardware is without damage or
2 deterioration at time of Substantial Completion.

3 3.5 DOOR HARDWARE SCHEDULE

4 A. DOOR 3004A

- 5 1. Hinges
- 6 2. Push
- 7 3. Pull
- 8 4. Closer

9 B. DOOR 3004B

- 10 1. Reuse Existing

11 C. DOOR 3005A

- 12 1. Hinges
- 13 2. Storeroom Lockset
- 14 3. Flushbolt

15 D. DOOR 3005B

- 16 1. Hinges
- 17 2. Storeroom Lockset
- 18 3. Flushbolt

19 E. DOOR 3005C

- 20 1. Hinges
- 21 2. Storeroom Lockset
- 22 3. Flushbolt

23 F. DOOR 3006A

- 24 1. Hinges
- 25 2. Entry Lockset
- 26 3. Closer
- 27 4. Electric Strike

28 G. DOOR 3006B

- 29 1. Reuse Existing

30 H. DOOR 3340A

- 31 1. Hinges
- 32 2. Entry Lockset
- 33 3. Closer
- 34 4. Electric Strike

35 I. DOOR 3340B

- 36 1. Hinges
- 37 2. Entry Lockset
- 38 3. Closer
- 39 4. Electric Strike

40 J. DOOR 33202A

- 41 1. Hinges
- 42 2. Entry Lockset
- 43 3. Closer

- 1 4. Electric Strike

- 2 K. DOOR 33205A
- 3 1. Reuse Existing

- 4 L. DOOR 33206A
- 5 1. Reuse Existing

- 6 M. DOOR 33207A
- 7 1. Hinges
- 8 2. Storeroom Lockset
- 9 3. Closer
- 10 4. Electric Strike

- 11 N. DOOR 33208A
- 12 1. Reuse Existing

- 13 O. DOOR 33601A
- 14 1. Hinges
- 15 2. Entry Lockset
- 16 3. Closer
- 17 4. Electric Strike

- 18 P. DOOR 33602A
- 19 1. Hinges
- 20 2. Passage Lockset
- 21 3. Closer
- 22 4. Dropdown Threshold Seal

- 23 Q. DOOR 33605A
- 24 1. Hinges
- 25 2. Passage Lockset
- 26 3. Door Stop

- 27 R. DOOR 33606A
- 28 1. Passage Lockset
- 29 2. Door Stop

- 30 S. DOOR 33607A
- 31 1. Hinges
- 32 2. Storeroom Lockset
- 33 3. Closer
- 34 4. Electric Strike

- 35 T. DOOR 33608A
- 36 1. Hinges
- 37 2. Office Lockset
- 38 3. Door Stop

- 39 END OF SECTION 087100

1 SECTION 088100 - GLAZING

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Section includes glazing for the following products and applications, including those specified in other
8 Sections where glazing requirements are specified by reference to this Section:

- 9
10 1. Doors
11 2. Interior borrowed lights

- 12 B. Related Sections:

- 13 1. Section 08210: Wood Doors.
14 2. Section 08872: Architectural Window Film

15 1.3 DEFINITIONS

- 16 A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in
17 referenced glazing publications.

- 18 B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

19 1.4 PERFORMANCE REQUIREMENTS

- 20 A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads
21 (where applicable) without failure, including loss or glass breakage attributable to the following:
22 defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and
23 airtight; deterioration of glazing materials; or other defects in construction.

24 1.5 SUBMITTALS

- 25 A. Product Data: For each glass product and glazing material indicated.

- 26 B. Samples: 12 inch x 12 inch glass

- 27 C. Product Certificates: For glass and glazing products, from manufacturer.

- 28 D. Preconstruction adhesion and compatibility test report.

- 29 E. Warranties: Sample of special warranties.

- 1 1.6 QUALITY ASSURANCE
- 2 A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A
3 qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- 4 B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are
5 certified under the National Glass Association's Certified Glass Installer Program.
- 6 C. Glazing Publications: Comply with published recommendations of glass product manufacturers and
7 organizations below, unless more stringent requirements are indicated. Refer to these publications for
8 glazing terms not otherwise defined in this Section or in referenced standards.
- 9 1. GANA Publications: GANA's "Glazing Manual."
10 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines
11 for Sealed Insulating Glass Units for Commercial and Residential Use."
- 12 D. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with
13 certification label of the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness,
14 and safety glazing standard with which glass complies.
- 15 E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one
16 component lite of units with appropriate certification label of IGCC.

17 1.7 DELIVERY, STORAGE, AND HANDLING

- 18 A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and
19 glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- 20 B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to
21 avoid hermetic seal ruptures due to altitude change.

22 1.8 WARRANTY

- 23 A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-
24 glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty
25 period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not
26 attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's
27 written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior
28 surfaces of glass.
- 29 1. Warranty Period: 10 years from date of Substantial Completion.

30 **PART 2 - PRODUCTS**

31 2.1 GLASS PRODUCTS, GENERAL

- 32 A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lights in thicknesses as
33 needed to comply with requirements indicated.
34 1. All interior glass shall be tempered.

- 1 2.2 GLASS PRODUCTS
- 2 A. Safety Glass, Type I, Class 1, Quality Q3, Kind FT- fully tempered, 1/4 inch thick.

- 3 2.3 GLAZING GASKETS
- 4 A. Dense Compression Gaskets: Molded or extruded dense EPDM or neoprene gaskets, complying with
- 5 ASTM C 864, of profile and hardness required to maintain watertight seal.

- 6 2.4 GLAZING SEALANTS
- 7 A. General: Provide products of type indicated, complying with the following requirements.
- 8 1. Compatibility: Provide glazing sealants that are compatible with one another and with other
- 9 materials they will contact, including glass products, and glazing channel substrates, under
- 10 conditions of service and application, as demonstrated by sealant manufacturer based on testing
- 11 and field experience.
- 12 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting
- 13 glazing sealants suitable for applications indicated and for conditions existing at time of
- 14 installation.
- 15 3. Colors of Exposed Glazing Sealants: As selected by A/E from manufacturer's full range of colors.

- 16 B. Elastomeric Glazing Sealant: Equivalent to Tremco Proglaze one-part, moisture curing, silicone
- 17 elastomeric sealant complying with ASTM C 920, FS-TT-S-001543A, FS-TT-S-00230C.

- 18 2.5 GLAZING TAPES
- 19 A. Back-Bedding Mastic Glazing Tapes: Performed, butyl-based elastomeric tape with a solids content of
- 20 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer
- 21 rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on
- 22 rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products
- 23 indicated below.
- 24 1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- 25 2.6 MISCELLANEOUS GLAZING MATERIALS
- 26 A. General: Provide products of material, size, and shape complying with referenced glazing standard,
- 27 requirements of manufacturers of glass and other glazing materials for application indicated, and with a
- 28 proven record of compatibility with surfaces contacted in installation.

- 29 B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

- 30 C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- 31 D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to
- 32 maintain glass lites in place for installation indicated.

- 33 E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- 34 2.7 FABRICATION OF GLAZING UNITS

- 1 A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face
2 clearances, edge and surface conditions, and bite complying with written instructions of product
3 manufacturer and referenced glazing publications, to comply with system performance requirements.
- 4 B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight
5 chamfers at junctions of edges and faces.
- 6 C. Grind smooth and polish exposed glass edges and corners.

7 **PART 3 - EXECUTION**

8 3.1 COORDINATION

- 9 A. Coordinate the work of this Section with Section 08210 contractors.

10 3.2 EXAMINATION

- 11 A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 12 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at
13 corners.
 - 14 2. Presence and functioning of weep systems.
 - 15 3. Minimum required face and edge clearances.
 - 16 4. Effective sealing between joints of glass-framing members.
- 17 B. Proceed with installation only after unsatisfactory conditions have been corrected.

18 3.3 PREPARATION

- 19 A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove
20 coatings not firmly bonded to substrates.
- 21 B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that
22 exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in
23 the completed work.

24 3.4 GLAZING

- 25 A. General:
 - 26 1. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other
27 glazing materials, unless more stringent requirements are indicated, including those in referenced
28 glazing publications.
 - 29 2. Adjust glazing channel dimensions as required by Project conditions during installation to provide
30 necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with
31 reasonable tolerances.
 - 32 3. Protect glass edges from damage during handling and installation. Remove damaged glass from
33 Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or
34 other imperfections that, when installed, could weaken glass and impair performance and
35 appearance.

- 1 4. Apply primers to joint surfaces where required for adhesion of sealants, as determined by
2 preconstruction testing.
- 3 5. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing
4 publications, unless otherwise required by glass manufacturer. Set blocks in thin course of
5 compatible sealant suitable for heel bead.
- 6 6. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

- 7 7. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
8 a. Locate spacers directly opposite each other on both inside and outside faces of glass.
9 Install correct size and spacing to preserve required face clearances, unless gaskets and
10 glazing tapes are used that have demonstrated ability to maintain required face clearances
11 and to comply with system performance requirements.
- 12 b. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to
13 sealant width. With glazing tape, use thickness slightly less than final compressed
14 thickness of tape.
- 15 8. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in
16 glazing channel, as recommended in writing by glass manufacturer and according to requirements
17 in referenced glazing publications.
- 18 9. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- 19 10. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

20 3.5 TAPE GLAZING

- 21 A. Dry/Dry:
- 22 1. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush
23 with or protrude slightly above sightline of stops.
 - 24 2. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to
25 make them fit opening.
 - 26 3. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover
27 horizontal framing joints by applying tapes to jambs and then to heads and sills.
 - 28 4. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal
29 joints in tapes with compatible sealant approved by tape manufacturer.
 - 30 5. Do not remove release paper from tape until just before each glazing unit is installed.
 - 31 6. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense
32 compression gaskets formed and installed to lock in place against faces of removable stops. Start
33 gasket applications at corners and work towards centers of openings.

34 3.6 CLEANING AND PROTECTION

- 35 A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to
36 framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and
37 clean surfaces.
- 38 B. Protect glass from contact with contaminating substances resulting from construction operations. If,
39 despite such protection, contaminating substances do come into contact with glass, remove substances
40 immediately as recommended in writing by glass manufacturer.
- 41 C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent
42 intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits,
43 or stains; remove as recommended in writing by glass manufacturer.
- 44 D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural
45 causes, accidents, and vandalism, during construction period.

1 E. Wash glass on both exposed surfaces in each area of Project not more than four days before date
2 scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in
3 writing by glass manufacturer.

4 END OF SECTION 088100

1 SECTION 092116 - GYPSUM BOARD ASSEMBLIES

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY
7

- 8 A. This Section includes the following:
9 1. Interior gypsum wallboard.
10 2. Non-load-bearing steel framing.

11 1.3 DEFINITIONS

- 12 A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies
13 not defined in this Section or in other referenced standards.

14 1.4 SUBMITTALS

- 15 A. Product Data: For each type of product indicated.
16 B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including
17 plans, elevations, sections, details of components, and attachments to other units of Work.

18 1.5 QUALITY ASSURANCE

- 19 A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials
20 and construction identical to those tested in assembly indicated according to ASTM E 90 and classified
21 according to ASTM E 413 by a qualified independent testing agency.
22 1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design
23 Manual."

24 1.6 DELIVERY, STORAGE, AND HANDLING

- 25 A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of
26 manufacturer or supplier.
27 B. Store materials inside under cover and keep them dry and protected against damage from weather, direct
28 sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels
29 flat to prevent sagging.

1 1.7 PROJECT CONDITIONS

- 2 A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's
3 written recommendations, whichever are more stringent.

4 PART 2 - PRODUCTS

5 2.1 MANUFACTURERS

- 6 A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that
7 may be incorporated into the Work include, but are not limited to, the following:

- 8 1. Steel Framing and Furring:
9 a. Dietrich Industries, Inc.
10 b. National Gypsum Company.
11 c. Unimast, Inc.
12 2. Gypsum Board and Related Products:
13 a. G-P Gypsum Corp.
14 b. Certainteed ProRoc.
15 c. United States Gypsum Co.

16 2.2 STEEL PARTITION FRAMING

- 17 A. Components, General: As follows:

- 18 1. Comply with ASTM C 754 for conditions indicated.
19 2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with
20 ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.

- 21 B. Steel Studs and Runners: ASTM C 645.

- 22 1. Minimum Base Metal Thickness: 0.027 inch (22 gauge).
23 2. Deflection Limit: L/240, unless otherwise indicated.
24 3. Depth and Spacing: As indicated.

- 25 C. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

- 26 1. Depth: 1-1/2 inches, unless otherwise indicated.
27 2. Clip Angle: 1-1/2 by 1-1/2 inch , 0.068-inch- thick, galvanized steel.

- 28 D. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other
29 properties required to fasten steel members to substrates.

30 2.3 INTERIOR GYPSUM WALLBOARD

- 31 A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and
32 correspond with support system indicated.

- 33 B. Gypsum Wallboard: ASTM C 36, 100 percent post-industrial recycled content (synthetic) gypsum shall
34 be used to manufacture the board materials. The synthetic gypsum shall be a byproduct of the flue gas
35 desulfurization (FGD) process, which removes sulfur dioxide from the emissions of coal-burning
36 electrical power plants. One local source of the gypsum board materials may be obtained from the USG
37 Gypsum Plant in East Chicago, IN or GP Gypsum, Wheatfield, IN.

- 38 1. Regular Type:
39 a. Thickness: 5/8 inch, unless otherwise indicated.

- 1 b. Long Edges: Tapered.
- 2 c. Location: As indicated.

3 2.4 TRIM ACCESSORIES

- 4 A. Interior Trim: ASTM C 1047.
- 5 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
- 6 2. Shapes:
- 7 a. Cornerbead: Use at outside corners, unless otherwise indicated.
- 8 b. L-Bead: L-shaped; exposed long leg receives joint compound.
- 9 c. Expansion (Control) Joints.

10 2.5 JOINT TREATMENT MATERIALS

- 11 A. General: Comply with ASTM C 475.
- 12 B. Joint Tape:
- 13 1. Interior Gypsum Wallboard: Paper.
- 14 2. Tile Backing Panels: As recommended by panel manufacturer.
- 15 C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with
- 16 other compounds applied on previous or for successive coats.
- 17 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
- 18 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim
- 19 flanges, use setting-type taping compound.
- 20 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
- 21 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- 22 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- 23 D. Joint Compound for Tile Backing Panels:
- 24 1. Cementitious Backer Units: As recommended by manufacturer.

25 2.6 ACOUSTICAL SEALANT

- 26 A. Available Products: Subject to compliance with requirements, products that may be incorporated into the
- 27 Work include, but are not limited to, the following. Refer to Division 7 Section "Joint Sealants" for
- 28 applicable general requirements.
- 29 1. Acoustical Sealant for Exposed and Concealed Joints:
- 30 a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
- 31 b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- 32 B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex
- 33 sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through
- 34 perimeter joints and openings in building construction as demonstrated by testing representative
- 35 assemblies according to ASTM E 90.

36 2.7 AUXILIARY MATERIALS

- 37 A. General: Provide auxiliary materials that comply with referenced installation standards and
- 38 manufacturer's written recommendations.

- 1 B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
2 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to
3 0.112 inch thick.
4 2. For fastening cementitious backer units, use screws of type and size recommended by panel
5 manufacturer.
- 6 C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by
7 combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
8 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

9 PART 3 - EXECUTION

10 3.1 EXAMINATION

- 11 A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in
12 anchors, and structural framing, for compliance with requirements and other conditions affecting
13 performance. Proceed with installation only after unsatisfactory conditions have been corrected.

14 3.2 PREPARATION

- 15 A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead
16 structure to ensure that inserts and other provisions for anchorages to building structure have been
17 installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop
18 their full strength.
19 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of
20 time needed for coordination and construction.

21 3.3 INSTALLING STEEL FRAMING, GENERAL

- 22 A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- 23 B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to
24 support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar
25 construction. Comply with details indicated and with gypsum board manufacturer's written
26 recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."
- 27 C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed
28 by structural movement.
- 29 D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both
30 sides of joints independently.

31 3.4 INSTALLING STEEL PARTITION

- 32 A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board
33 assemblies abut other construction.
34 1. Where studs are installed directly against exterior walls, install asphalt-felt isolation strip between
35 studs and wall.

- 1 B. Extend partition framing full height to structural supports or substrates above suspended ceilings, except
2 where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors
3 and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum
4 board.
5 1. Cut studs 1/2 inch short of full height to provide perimeter relief.
- 6 C. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be
7 attached to open (unsupported) edges of stud flanges first.
- 8 D. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written
9 recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door
10 frames; install runner track section (for cripple studs) at head and secure to jamb studs.
11 1. Install two studs at each jamb, unless otherwise indicated.
12 2. Extend jamb studs through suspended ceilings and attach to underside of top plate.
- 13 E. Frame openings other than door openings the same as required for door openings, unless otherwise
14 indicated. Install framing below sills of openings to match framing required above door heads.
- 15 3.5 APPLYING AND FINISHING PANELS, GENERAL
- 16 A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- 17 B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed
18 after panels have been installed on one side.
- 19 C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid
20 abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not
21 less than one framing member.
- 22 D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with
23 not more than 1/16 inch of open space between panels. Do not force into place.
- 24 E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or
25 gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges
26 or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control
27 joints at corners of framed openings.
- 28 F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open
29 (unsupported) edges of stud flanges first.
- 30 G. Attach gypsum panels to framing provided at openings and cutouts.
- 31 H. Form control and expansion joints with space between edges of adjoining gypsum panels.
- 32 I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings,
33 etc.), except in chases braced internally.
34 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings,
35 coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
36 2. Fit gypsum panels around ducts, pipes, and conduits.
37 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members
38 projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed
39 by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install
40 sealant.

- 1 J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors.
2 Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where
3 edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with
4 acoustical sealant.
- 5 K. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at
6 openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both
7 faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's
8 written recommendations for locating edge trim and closing off sound-flanking paths around or through
9 gypsum board assemblies, including sealing partitions above acoustical ceilings.
- 10 L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing
11 standard and manufacturer's written recommendations.
- 12 M. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

13 3.6 PANEL APPLICATION METHODS

- 14 A. Single-Layer Application:
 - 15 1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent
16 possible and at right angles to framing, unless otherwise indicated.
 - 17 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise
18 indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - 19 a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - 20 b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or
21 required by fire-resistance-rated assembly.
 - 22 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints.
23 Locate edge joints over furring members.
- 24 B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

25 3.7 INSTALLING TRIM ACCESSORIES

- 26 A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for
27 panels. Otherwise, attach trim according to manufacturer's written instructions.
- 28 B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by
29 Architect for visual effect.

30 3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- 31 A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener
32 heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
33 Promptly remove residual joint compound from adjacent surfaces.
- 34 B. Prefill open joints and damaged surface areas.
- 35 C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- 36 D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for
37 locations indicated:

- 1 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated,
2 unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated
3 assemblies.
- 4 2. Level 3 is suitable for surfaces receiving medium- or heavy-textured finishes before painting or
5 heavy wallcoverings where lighting conditions are not critical.
- 6 a. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape,
7 fasteners, and trim flanges.
- 8 3. Level 4 is suitable for surfaces receiving light-textured finish wallcoverings and flat paints. It is
9 generally the standard exposed finish.
- 10 a. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to
11 tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless
12 otherwise indicated.
- 13 4. Level 5 is suitable for surfaces receiving gloss and semigloss enamels and surfaces subject to
14 severe lighting. It is considered a high-quality gypsum board finish.
- 15 a. Level 5 (For large uninterrupted surfaces where the Architect determines that Level 4
16 finish is unacceptable): Embed tape and apply separate first, fill, and finish coats of joint
17 compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over
18 entire surface at extensive uninterrupted wall or ceiling surfaces including but not limited
19 to curved walls and soffits.

20 E. Texture Finish: By Section 099123 contractor.

21

22 END OF SECTION 092116

1 SECTION 095110 - ACOUSTICAL PANEL CEILINGS

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes acoustical panels and exposed suspension systems for ceilings.

8 1.3 SUBMITTALS

- 9 A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown
10 and coordinated with each other, based on input from installers of the items involved:
- 11 1. Ceiling suspension system members.
 - 12 2. Method of attaching hangers to building structure.
 - 13 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access
14 panels, and special molding.
 - 15 a. For products having recycled content, documentation indicating percentages by weight of
16 postconsumer and pre-consumer recycled content.
 - 17 b. For sealants, including printed statement of VOC content.

18 1.4 QUALITY ASSURANCE

- 19 A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system
20 through one source from a single manufacturer.

21 1.5 DELIVERY, STORAGE, AND HANDLING

- 22 A. Deliver acoustical panels, suspension system components, and accessories to Project site in original,
23 unopened packages and store them in a fully enclosed, conditioned space where they will be protected
24 against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination,
25 and other causes.

- 26 B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture
27 content.

- 28 C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

29 1.6 PROJECT CONDITIONS

- 30 A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and
31 weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient

1 temperature and humidity conditions are maintained at the levels indicated for Project when occupied for
2 its intended use.

3 1.7 COORDINATION

4 A. Coordinate layout and installation of acoustical panels and suspension system with other construction that
5 penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression
6 system, and partition assemblies.

7 **PART 2 - PRODUCTS**

8 2.1 ACOUSTICAL PANELS

9 A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that
10 comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light
11 reflectance, unless otherwise indicated.

12 B. Acoustical Panel Colors and Patterns (ACT-1):

13 1. Armstrong Cirrus HRC Tiles Total Recycled Content: 83%, Post industrial is 54% and Post
14 consumer is 29%.

15 a. Size: 2 by 2.

16 b. Color: White.

17 c. Edge: Tegular.

18 2.2 METAL SUSPENSION SYSTEMS, GENERAL

19 A. Recycled Content: Provide products made from steel sheet with average recycled content such that
20 postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

21 B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension
22 systems of types, structural classifications, and finishes indicated that comply with applicable
23 requirements in ASTM C 635.

24 C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and
25 Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's
26 standard factory-applied finish for type of system indicated.

27 D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct
28 Hung," unless otherwise indicated.

29 2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

30 A. Grid for ACT-1: Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60 (Z180), Steel Suspension
31 System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to
32 ASTM A 653/A 653M, G60 (Z180) coating designation, with prefinished, cold-rolled, 15/16-inch- (24-
33 mm-) wide, aluminum caps on flanges.

34 1. Structural Classification: Intermediate-duty system.

35 2. Face Design: Flat, flush.

36 3. Face Finish: Painted white.

1 2.4 ACOUSTICAL SEALANT

- 2 A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable,
3 nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to
4 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing
5 airborne sound transmission through perimeter joints and openings in building construction as
6 demonstrated by testing representative assemblies according to ASTM E 90.

7 **PART 3 - EXECUTION**

8 3.1 EXAMINATION

- 9 A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings
10 attach or abut, with Installer present, for compliance with requirements specified in this and other
11 Sections that affect ceiling installation and anchorage and with requirements for installation tolerances
12 and other conditions affecting performance of acoustical panel ceilings.
13 1. Proceed with installation only after unsatisfactory conditions have been corrected.

14 3.2 PREPARATION

- 15 A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite
16 edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown
17 on reflected ceiling plans.

18 3.3 INSTALLATION

- 19 A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written
20 instructions and CISCA's "Ceiling Systems Handbook."
- 21 B. Suspend ceiling hangers from building's structural members and as follows:
22 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum
23 that are not part of supporting structure or of ceiling suspension system.
24 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by
25 bracing, counter splaying, or other equally effective means.
26 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that
27 interfere with location of hangers at spacings required to support standard suspension system
28 members, install supplemental suspension members and hangers in form of trapezes or equivalent
29 devices.
30 4. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to
31 cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated
32 fasteners that extend through forms into concrete.
33 5. When steel framing does not permit installation of hanger wires at spacing required, install
34 carrying channels or other supplemental support for attachment of hanger wires.
35 6. Do not attach hangers to steel deck tabs.
36 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
37 8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly
38 from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from
39 ends of each member.
40 9. Size supplemental suspension members and hangers to support ceiling loads within performance
41 limits established by referenced standards and publications.

1 C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns.
2 Suspend bracing from building's structural members as required for hangers, without attaching to
3 permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-
4 place or post installed anchors.

5 D. Install suspension system runners so they are square and securely interlocked with one another. Remove
6 and replace dented, bent, or kinked members.

7 E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and
8 edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

- 9 1. Arrange directionally patterned acoustical panels as follows:
 - 10 a. As indicated on reflected ceiling plans.
 - 11 2. For square-edged panels, install panels with edges fully hidden from view by flanges of
 - 12 suspension system runners and moldings.
 - 13 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm
 - 14 contact with top surface of runner flanges.
 - 15 4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel
 - 16 surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 17 5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and
 - 18 for fire-resistance ratings; space as recommended by panel manufacturer's written instructions,
 - 19 unless otherwise indicated.

20 3.4 CLEANING

21 A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension
22 system members. Comply with manufacturer's written instructions for cleaning and touchup of minor
23 finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired
24 to permanently eliminate evidence of damage.

25 END OF SECTION 095110

1 SECTION 096500 – RESILIENT FLOORING, WALL BASE AND ACCESSORIES

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Section Includes:

- 8 1. Resilient Flooring
9 2. Resilient Base
10 3. Preparation of substrate surfaces

11 1.3 SUBMITTALS

- 12 A. Product Data: For each type of product indicated.
13 1. For adhesives, including printed statement of VOC content.
14 B. Samples: Submit samples for verification purposes for each color of flooring and base.
15 C. Maintenance Instructions: Submit 2 copies of manufacturer’s recommended maintenance practices for
16 each type of resilient flooring and accessory required.

17 1.4 QUALITY ASSURANCE

- 18 A. Fire-Test-Response Characteristics: As determined by testing identical products according to
19 ASTM E 648 or NFPA 253 by a qualified testing agency.
20 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
21 B. Installer’s Qualifications: Engage an experienced installer to perform work of this Section who has
22 specialized in installing resilient products similar to those required for this Project and with a record of
23 successful in-service performance.

24 1.5 DELIVERY, STORAGE, AND HANDLING

- 25 A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient
26 temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10
27 deg C) or more than 90 deg F (32 deg C).

28 1.6 PROJECT CONDITIONS

- 29 A. Install resilient products after other finishing operations, including painting, have been completed.

1 **PART 2 - PRODUCTS**

2 2.1 RESILIENT TILE FLOORING

3 A. Norament 925 GRANO, Article 1880, 39.37 inches x 39.37 inches x .014 inch thick.

4 1. Color: #4898 "Ammonite".

5 B. Johnsonite, MicroTone Speckled Rubber Tile, 24 inches x 24 inches x .08 inch thick.

6 1. Color: #HNSP-LB8 Vortex

7 2.2 RESILIENT BASE

8 A. Resilient Base:

9 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

10 a. Johnsonite.

11 B. Resilient Base Standard: ASTM F 1861.

12 1. Material Requirement: Type TP (rubber, thermoplastic).

13 2. Manufacturing Method: Group I (solid, homogeneous).

14 3. Style: Straight.

15 C. Minimum Thickness: 0.125 inch (3.2 mm).

16 D. Height: 6 inches (102 mm).

17 E. Lengths: Coils in manufacturer's standard length.

18 F. Outside Corners: Job formed or preformed.

19 G. Inside Corners: Job formed or preformed.

20 H. Color: Black.

21 2.3 RESILIENT TRANSITION

22 A. 1/8 inch thick, homogenous vinyl or rubber composition, tapered or bullnose edge, not less than 1 inch
23 wide. Color: Black

24 2.4 INSTALLATION MATERIALS

25 A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended
26 hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

27 B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate
28 conditions indicated.

29 1. Use adhesives that comply with the following limits for VOC content when calculated according
30 to 40 CFR 59, Subpart D (EPA Method 24):

31 a. Cove Base Adhesives: Not more than 50 g/L.
32
33

1 **PART 3 - EXECUTION**

2 3.1 EXAMINATION

- 3 A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture
4 content and other conditions affecting performance of the Work.
- 5 B. Verify that finishes of substrates comply with tolerances and other requirements specified in other
6 Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might
7 interfere with adhesion of resilient products.
- 8 C. Proceed with installation only after unsatisfactory conditions have been corrected.

9 3.2 PREPARATION

- 10 A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient
11 products.

12 3.3 INSTALLATION

13 A. GENERAL:

- 14 1. Install resilient flooring using method indicated in strict compliance with manufacturer's printed
15 instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar
16 openings.
- 17 2. Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes,
18 outlets and permanent columns, walls and partitions.
- 19 3. Tightly cement resilient flooring to substrate without open cracks, voids, raising and puckering at
20 joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient
21 flooring at perimeter of each covered area to assure adhesion.

22 B. TILE FLOORING

- 23 1. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile
24 at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less
25 than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise indicated.
- 26 2. Match tiles for color and pattern by using tile form cartons in same sequence as manufactured and
27 packaged if so numbered. Cut tile neatly around all fixtures, Broken, cracked, chipped, or
28 deformed tiles are not acceptable.
- 29 3. Lay tile with grain running in direction as existing tile flooring installations.
- 30 4. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring
31 manufactures directions.

32 C. RESILIENT BASE INSTALLATION

- 33 1. Comply with manufacturer's written instructions for installing resilient base.
- 34 2. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other
35 permanent fixtures in rooms and areas where base is required.
- 36 3. Install resilient base in lengths as long as practicable without gaps at seams and with tops of
37 adjacent pieces aligned.
- 38 4. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous
39 contact with horizontal and vertical substrates.
- 40 5. Do not stretch resilient base during installation.
- 41 6. Retain first paragraph below if required or revise to suit Project.

- 1 7. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base
- 2 with manufacturer's recommended adhesive filler material.
- 3 8. Preformed Corners: Install preformed corners before installing straight pieces.
- 4 9. Job-Formed Corners:
- 5 a. Outside Corners: Use straight pieces of maximum lengths possible. Form without
- 6 producing discoloration (whitening) at bends.
- 7 b. Inside Corners: Use straight pieces of maximum lengths possible.

8 3.4 CLEANING AND PROTECTION

- 9 A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- 10 B. Perform the following operations immediately after completing resilient product installation:
- 11 1. Remove adhesive and other blemishes from exposed surfaces.

12 END OF SECTION 096500

1 SECTION 096800 - CARPET

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes the following:
8 1. Tufted carpet for direct glue application.
9 2. Carpet Tile for direct glue application.

10 1.3 SUBMITTALS

- 11 A. Product Data: For the following, including installation recommendations for each type of substrate:
12 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics,
13 durability, and fade resistance.
14 2. For installation adhesive, including printed statement of VOC content.
- 15 B. Samples: Provide 12 inch x 12 inch sample of each type of carpet specified for verification purposes.
- 16 C. Warranties: Special warranties specified in this Section.

17 1.4 DELIVERY, STORAGE, AND HANDLING

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

19 1.5 PROJECT CONDITIONS

- 20 A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12,
21 "Ventilation."
- 22 B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and
23 ambient temperature and humidity conditions are maintained at the levels indicated for Project when
24 occupied for its intended use.
- 25 C. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet
26 before installing these items.

27 1.6 WARRANTY

- 28 A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or
29 replace components of carpet installation that fail in materials or workmanship within specified warranty
30 period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to:
 - a. Wear - Lifetime of Carpet. No more than 10% face yarn loss by weight in normal use.
 - b. Static - Lifetime of Carpet.
 - c. Edge Ravel - Lifetime of Carpet. Guaranteed no edge ravel in normal use (no seam sealer required).
 - d. Delamination - Lifetime of Carpet. Guaranteed no delamination in normal use. Chair pads are not required, but are recommended for maximum appearance retention.
 - e. Tuft Bind - Lifetime of Carpet. Guaranteed not to zipper, wet or dry.
 - f. Adhesive - Lees warrants that the use of Lees adhesives will bond the carpet to the properly prepared substrate for the life of the carpet. Substrate must meet Lees recommended floor preparation procedures. Should Lees adhesive not be used, Lifetime Adhesive Warranties become null and void.
 - g. Stain Resistance - Lees provides lifetime stain warranty and a 10 year Lightfastness and Atmospheric Contaminant Warranty on all Duracolor carpets. This lifetime stain warranty covers all Duracolor carpets made by Lees.
 - h. * Under GSA requirements stain resistant carpets must score no less than 8.0 (10.0 is best) on the AATCC Red 40 Stain Scale. Carpet samples must first be exposed to 100 revolutions of the Taber abrader (1,000-gram weight per H-18 wheel) and then the abraded area must be stain tested using AATCC test method 175.

22 1.7 EXTRA MATERIALS

- A. Before installation begins, furnish quantity of full-size units equal to 5 percent of each type and color of carpet tiles installed.
- B. Deliver extra carpet tile materials to Owner's designated storage space, properly packaged with protective covering and identified with labels describing contents.

27 **PART 2 - PRODUCTS CARPET**

- A. Product; Lees, Faculty V: Blue Note #4127
 1. Construction – tufted.
 2. Surface Texture - performance loop pile.
 3. Gauge - 1/8" (31.5/10 cm).
 4. Stitches Per Inch - 8.3 per inch (32.68/10 cm).
 5. Finished Pile Thickness – 145 inch avg (3.7 mm).
 6. Dye Method - yarn dyed.
 7. Backing Material - Unibond® by LEES.
 8. Face Yarn - Antron® Legacy nylon 6,6 with DuraTech Soil Protection by DuPont.
 9. Fiber Technology - Duracolor® by LEES Stain Resistant System. Passes GSA requirements for permanent stain resistant carpet.
 10. Face Weight - 26 oz/yd2 (881.66 gm/m2).
 11. Size/Width - 12 feet width (3.66 m).
 12. Pattern Repeat - n/a.
- B. Performance:
 1. Static - 3.0 kv when tested under the Standard Shuffle Test 70 degrees Fahrenheit (21 degrees Celsius) - 20% R.H.
 2. Flammability - Passes DOC-FF-1-70 Pill Test.
 3. Flooring Radiant Panel Test - Meets NFPA Class 1 when tested under ASTM E-648 glue down.
 4. Smoke Density - NBS Smoke Chamber NFPA-258 - Less than 450 Flaming Mode.
 5. CRI Green Label Plus Certified – Y.

1 6. Construction Materials - 100% man-made materials for superior stability. Specifications are
2 subject to change without notice when such changes do not alter product performance. Slight color
3 variation may occur from dye lot to dye lot.

4 2.2 INSTALLATION ACCESSORIES

5 A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation
6 provided or recommended by carpet manufacturer.

7 B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions
8 indicated, that complies with flammability requirements for installed carpet and is recommended or
9 provided by carpet manufacturer.

10 1. VOC Limits: Provide adhesives with VOC content not more than 50g/L when calculated
11 according to 40 CFR 59, Subpart D (EPA method 24).

12 C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for
13 sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at
14 seams.

15 D. Carpet Tile Reducer Strip: Extruded or molded heavy-duty rubber carpet tile reducer strip of size and
16 profile recommended by carpet tile manufacturer with a minimum 2-inch wide anchorage flange. Colors
17 as selected by A/E from manufacturer's standard colors.

18 E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect
19 exposed edge of carpet, and of maximum lengths to minimize running joints.

20 **PART 3 - EXECUTION**

21 3.1 EXAMINATION

22 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for
23 maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet
24 performance. Examine carpet for type, color, pattern, and potential defects.

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

26 3.2 PREPARATION

27 A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet
28 manufacturer's written installation instructions for preparing substrates.

29 B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill
30 cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions **1/8**
31 **inch (3 mm)** wide or wider, and protrusions more than **1/32 inch (0.8 mm)**, unless more stringent
32 requirements are required by manufacturer's written instructions.

33 C. Remove coatings, including curing compounds, and other substances that are incompatible with
34 adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods
35 recommended in writing by carpet manufacturer.

1 D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

2 3.3 INSTALLATION

3 A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:

4 1. Direct-Glue-Down Installation

5 B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and
6 direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams
7 under the door in closed position.

8 C. Do not bridge building expansion joints with carpet.

9 D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including
10 cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by
11 carpet manufacturer.

12 E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges,
13 alcoves, and similar openings.

14 F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by
15 repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

16 G. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet
17 Installations" and with carpet manufacturer's written recommendations.

18 3.4 CLEANING AND PROTECTING

19 A. Perform the following operations immediately after installing carpet:

20 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by
21 carpet manufacturer.

22 2. Remove yarns that protrude from carpet surface.

23 3. Vacuum carpet using commercial machine with face-beater element.

24 B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."

25 C. Protect carpet against damage from construction operations and placement of equipment and fixtures
26 during the remainder of construction period. Use protection methods indicated or recommended in
27 writing by carpet manufacturer and carpet adhesive manufacturer.

28 END OF SECTION 096800

06.17.2015

1 Division 09 77 00 – SPECIAL WALL SURFACING (GLASS FIBER REINFORCED PLASTIC
2 PANELING)

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes: Fiberglass reinforced plastic (FRP) paneling for wall and ceiling
6 surfaces, including trim accessories,

7 **PART 2 – PRODUCTS**

8 **2.1 FIBERGLASS REINFORCED PLASTIC (FRP-1) PANELS**

9 A. Accessible product:

- 10 i. Basis of Design: Marlite Standard FRP.
- 11 ii. Crane Kemlite, Glassbond Panels.
- 12 iii. BP Chemicals, Tufliner Panels.
- 13 iv. Nudo Products, Inc., Fiber-Lite LP-F9 Panels.

14 B. Characteristics:

- 15 i. Material: Fiberglass reinforced plastic (FRP).
- 16 ii. Thickness: 3/32", minimum.
- 17 iii. Size: 4'-0"x10'-0" to provide full height vertical installation without
Horizontal seams.
- 18 iv. Finish: Manufacturers standard smooth surface on exposed side
- 19 v. Fire resistance rating: Class-A

20 **2.2 ACCESSORY PRODUCTS:**

21 A. Adhesives: Waterproof mastic and contact type adhesives as recommended by
22 panel manufacturer for substrates involved.

END OF SECTION

1 SECTION 09912 - INTERIOR PAINTING

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. This Section includes surface preparation and the application of paint systems on the following interior
8 substrates:

- 9 1. Gypsum board.
10 2. Hollow metal frames.
11 3. Stain finish for wood windows and doors.
12 4. Miscellaneous interior surfaces.

13 1.3 SUBMITTALS

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

- 15 1. Product Data: For paints, including printed statement of VOC content and chemical components.

- 16 B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

- 17 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
18 2. Label each Sample for location and application area.

19 1.4 QUALITY ASSURANCE

- 20 A. MPI Standards:

- 21 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
22 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting
23 Specification Manual" and "MPI Maintenance Repainting Manual" for products and paint systems
24 indicated.

25 1.5 DELIVERY, STORAGE, AND HANDLING

- 26 A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures
27 continuously maintained at not less than 45 deg F (7 deg C).

- 28 1. Maintain containers in clean condition, free of foreign materials and residue.
29 2. Remove rags and waste from storage areas daily.

- 1 1.6 PROJECT CONDITIONS
- 2 A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between
3 50 and 95 deg F (10 and 35 deg C).
- 4 B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3
5 deg C) above the dew point; or to damp or wet surfaces.
- 6 C. Before painting is started in any area, broom clean and remove excessive dust.
- 7 D. After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall be
8 done only with commercial vacuum cleaning equipment.
- 9 E. Provide adequate illumination in all areas where painting operations are in progress.

10 **PART 2 - PRODUCTS**

11 2.1 MANUFACTURERS

- 12 A. Manufacturer:
13 1. Mautz
14 2. Sherwin Williams
15 3. Rosco

16 2.2 PAINT, GENERAL

- 17 A. Provide all painting materials of the best quality and approved by the Owner. They shall bear identifying
18 labels on the containers with the manufacturer's instructions printed thereon. Paint containers not bearing
19 manufacturer's identifying labels or bearing identifying labels of the manufacturers not approved by the
20 Owner will not be permitted on the project site.
- 21 B. Paint shall not be badly settled, cakes, or thickened in the container, shall be readily dispersed with a
22 paddle to a smooth consistency and shall have excellent application properties.
- 23 C. Deliver paint to the job color-mixed except for tinting of undercoats and possible thinning.
- 24 D. Tinting materials shall be recommended by the manufacturer for the particular material tinted.
- 25 E. Insure that all mixed colors match the color selection made by the A/E prior to application of the coating.
- 26 F. Material Compatibility:
- 27 1. Provide materials for use within each paint system that are compatible with one another and
28 substrates indicated, under conditions of service and application as demonstrated by manufacturer,
29 based on testing and field experience.
- 30 2. For each coat in a paint system, provide products recommended in writing by manufacturers of
31 topcoat for use in paint system and on substrate indicated.
- 32 G. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the
33 following limits for VOC content, exclusive of colorants added to a tint base, when calculated according
34 to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that
35 are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
- H. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.

I. Colors: as indicated in Schedule.

2.3 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer:

1. Safecoat New Wallboard Primecoat HPV
2. Safecoat Transitional Primer
3. AFM MetalCoat Acrylic Metal Primer

2.4 LATEX PAINTS

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

1. VOC Content: E Range of E3.

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

2 1. VOC Content: E Range of E3.

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

4 1. VOC Content: E Range of E3.

5 **PART 3 - EXECUTION**

6 3.1 EXAMINATION

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

9 B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
10 1. Gypsum Board: 12 percent.

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

13 D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
14 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

15 3.2 PREPARATION

16 A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting
17 Specification Manual" applicable to substrates indicated.

18 B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If
19 removal is impractical or impossible because of size or weight of item, provide surface-applied protection
20 before surface preparation and painting.

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

23 2. Do not paint over labels of independent testing agencies or equipment name, identification,
24 performance rating, or nomenclature plates.

25 C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and
26 incompatible paints and encapsulants.

27 1. Remove incompatible primers and reprime substrate with compatible primers as required to
28 produce paint systems indicated.

29 D. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded
30 smooth.

31

32 E. Wood Surfaces:

33 1. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other
34 recommended know sealer before application of primer. After priming, fill holes and
35 imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- 1 2. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces,
2 undersides, and backsides of wood.

3 3.3 APPLICATION

- 4 A. Apply paints according to manufacturer's written instructions.
5 1. Use applicators and techniques suited for paint and substrate indicated.
6 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before
7 final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat
8 only.
9 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items
10 to match exposed surfaces.
- 11 B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same
12 material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in
13 shade of undercoats to distinguish each separate coat.
- 14 C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a
15 uniform paint finish, color, and appearance.
- 16 D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller
17 tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
18 1. All metal surfaces to have paint spray applied.
- 19 E. Painting Mechanical and Electrical Work: Paint items exposed in occupied spaces including, but not
20 limited to, the following:
- 21 1. Mechanical Work:
22 a. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and
23 outlets.
24 2. Electrical Work:
25 a. Electrical equipment that is indicated to have a factory-primed finish for field painting.

26 3.4 CLEANING AND PROTECTION

- 27 A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing,
28 scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- 29 B. Protect work of other trades against damage from paint application. Correct damage to work of other
30 trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an
31 undamaged condition.
- 32 C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted
33 surfaces.

34 3.5 INTERIOR PAINTING SCHEDULE

- 35 A. Surfaces to be painted are listed in the Room Finish Schedule, and indicated on the Drawings
- 36 B. Steel Substrates:
- 37 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.

- 1 a. Prime Coat: Rust-inhibitive primer (water based).
- 2 b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
- 3 c. Topcoat: Institutional low-odor/VOC interior latex semi gloss as scheduled.

- 4 C. Gypsum Board Substrates:

- 5 1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.

- 6 a. Prime Coat: Interior latex primer/sealer.
- 7 b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
- 8 c. Topcoat: Institutional low-odor/VOC interior latex as scheduled with the following sheen:
- 9 1) Walls, ceilings and soffits: (eggshell).
- 10 2) Walls requiring clean-down, as scheduled: (semi gloss).

- 11 D. Stained Wood Substrates:

- 12 1. Moisture-Cured Clear Polyurethane Over Stain System: MPI INT 6.3Y.

- 13 a. Stain Coat: Interior wood stain (semitransparent).
- 14 b. Two Finish Coats: Moisture-cured clear polyurethane (flat).

- 15 E. Miscellaneous Finishes
- 16 1. Finish mechanical piping and electrical conduits, boxes; sprinkler piping and brackets; ductwork
- 17 and accessories scheduled to receive wall and ceiling finishes with 2 spray coats Interior Latex
- 18 Satin Dryfall I-1450(waterborne Acrylic Dryfall B42 Series) over appropriate primer.

19 END OF SECTION 099123

1 Division 10 26 00 IMPACT WALL PROTECTION

2 **PART 1 - GENERAL**

3 **1.01 SUMMARY**

A. Non PVC corner guard system for wall protection and decoration

5 **1.02 SECTION INCLUDES**

6 A. G2 Series Tape-on Smooth Corner Guard Systems

7 **1.03 REFERENCES**

- 8 A. American National Standards Institute (ANSI)
9 B. American Society for Testing and Materials (ASTM)
10 C. National Fire Protection Association (NFPA)
11 D. Society of Automotive Engineers (SAE)

12 **1.04 SYSTEM DESCRIPTION**

13 A. Performance Requirements: Provide corner guard systems that conform to the following requirements of regulatory agencies and the quality control of IPC Door and Wall Protection Systems, InPro Corporation.

14 1. Fire Performance Characteristics: Provide material conforming to the NFPA Class A fire rating. Surface burning characteristics, as determined by ASTM E-84, shall be flame spread of 25 or less and smoke development of 450 or less.

15 2. Impact Strength: Provide materials that have been tested in accordance with the applicable provisions of ASTM D-256, Impact Resistance of Plastics.

16 3. Chemical and Stain Resistance: Provide material that shows resistance to stain when tested in accordance with applicable provisions of ASTM D-543.

17 4. Fungal and Bacterial Resistance: Provide material that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.

18 5. GREENGUARD Certified: Provide GREENGUARD Certified material. Profiles shall meet the requirements of GREENGUARD Certification Standards for Low-Emitting Products and GREENGUARD Product Emission Standard for Children & Schools.

19 6. Color Consistency: Provide components matched in accordance with SAE J-1545 - (Delta E) with a color difference no greater than 1.0 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.

20 **1.05 SUBMITTALS**

21 A. Product Data: Manufacturer's printed product data for each product indicated in this section.

22 B. Detail Drawings: Mounting details with the appropriate fasteners for specific project substrates.

23 C. Samples: Verification samples of corner guard, 8" (203mm) long, in full size profiles of each type and color indicated.

24 D. Manufacturer's Installation Instructions: Printed installation instructions for each corner guard.

25 **1.06 DELIVERY, STORAGE AND HANDLING**

26 A. Deliver materials in unopened factory packaging to the jobsite

27 B. Inspect materials at delivery to assure that specified products have been received.

28 C. Store in original packaging in a climate controlled location away from direct sunlight.

29 **1.07 PROJECT CONDITIONS**

- 30 A. Environmental Requirements: Install products in an interior climate controlled environment.
- 31 **1.08 WARRANTY**
- 32 A. Standard IPC Limited Lifetime Warranty against material and manufacturing defects.
- 33 **PART 2 – PRODUCTS**
- 34 **2.01 MANUFACTURER**
- 35 A. Acceptable Manufacturer: IPC Interior Protection Products and Decorative Surfaces
InPro Corporation, PO Box 406, Muskego, WI 53150, USA
Telephone: 800.222.5556, Fax: 888.715.8407
www.inprocorp.com
- 39 B. Substitutions: Not permitted
- 40 C. Provide all corner guard and wall protection from a single manufacturer.
- 41 **2.02 MANUFACTURED UNITS**
- 42 A. Corner Guard Profile
- 43 1. G2 Series Smooth Tape-on Corner Guard
- 44 1-1/2" (38mm) x 1-1/2" (38mm) 90 degree
- 45 Standard heights: 3' (.91m), 4' (1.22m), 8' (2.44m), 9' (2.74m) and 12' (3.66m).
- 46 Options: Custom heights available.
- 47 **2.03 MATERIALS**
- 48 A. Reformulated PETG with Biopolymer Blend: Corner Guard of .080" (2mm) thickness shall be extruded from chemical and stain resistant PETG.
- 49 **2.04 COMPONENTS**
- 50 A. Attachments
- 51 1. Tape: Factory applied double-faced foam tape.
- 52 2. Adhesive: Field applied heavy-duty adhesive.
- 53 **2.05 FINISHES**
- 54 A. Corner Guard Covers: Corner guard colors to be selected by the architect from the IPC finish selection.
- 55 **PART 3 – EXECUTION**
- 56 **3.01 EXAMINATION**
- 57 A. Examine areas and conditions in which the corner guard system will be installed.
- 58 1. Complete all finishing operations, including painting, before beginning installation of corner guard system materials.
- 59 2. Wall surface shall be dry and free from dirt, grease and loose paint.
- 60 **3.02 PREPARATION**
- 61 A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.
- 62 **3.03 INSTALLATION**
- 63 A. General: Locate corner guard as indicated on approved detail drawings for the appropriate substrate and in compliance with the IPC installation instructions. Install corner guard level and plumb at the height indicated on the drawings.
- 64 B. Installation of G2 Series Smooth Tape-on Corner Guard:
- 65 1. Allow the corner guards to reach room temperature before installing. The wall surface that the corner guards are to be applied must be dry and free of dirt,

dust, oil, loose paint wax and grease. Note: When adhering to textured or difficult surfaces, such as stucco, glazed block or wall paper, use IPC# 535 Heavy Duty Adhesive to adhere corner guards. Corner Guards should be ordered without tape.

66 2. Installation with factory applied foam tape: Peel the paper release backing from the tape-on corner guard. Starting at the bottom, position the corner guard on the wall. Continue making contact between the corner guard and the corner over the entire height of the corner guard.

67 3. Installation with Heavy Duty Adhesive: Cut a small opening in the spout of the adhesive cartridge. Apply a continuous bead of adhesive on each wing of the corner guard. Starting at the bottom, position the corner guard on the wall. Continue making contact between the corner guard and the corner over the entire height of the corner guard.

68 4. Apply firm pressure to the entire surface of the corner guard to ensure a firm bond. An extension roller will aid this step. Note: Smooth Tape-on Corner Guards are available without factory applied double-faced foam tape. When ordering, denote with suffix "n" after the model number.

69 **3.04 CLEANING**

70 A. At completion of the installation, clean surfaces in accordance with the IPC clean-up and maintenance instructions.

END OF SECTION

1 Division 10 26 50 IMPACT WALL PROTECTION

2 **PART 1 - GENERAL**

3 **1.01 SUMMARY**

A. Non PVC corner guard system for wall protection and decoration

5 **1.02 SECTION INCLUDES**

6 A. G2 Series Tape-on Smooth Corner Guard Systems

7 **1.03 REFERENCES**

- 8 A. American National Standards Institute (ANSI)
9 B. American Society for Testing and Materials (ASTM)
10 C. National Fire Protection Association (NFPA)
11 D. Society of Automotive Engineers (SAE)

12 **1.04 SYSTEM DESCRIPTION**

13 A. Performance Requirements: Provide corner guard systems that conform to the following requirements of regulatory agencies and the quality control of IPC Door and Wall Protection Systems, InPro Corporation.

14 1. Fire Performance Characteristics: Provide material conforming to the NFPA Class A fire rating. Surface burning characteristics, as determined by ASTM E-84, shall be flame spread of 25 or less and smoke development of 450 or less.

15 2. Impact Strength: Provide materials that have been tested in accordance with the applicable provisions of ASTM D-256, Impact Resistance of Plastics.

16 3. Chemical and Stain Resistance: Provide material that shows resistance to stain when tested in accordance with applicable provisions of ASTM D-543.

17 4. Fungal and Bacterial Resistance: Provide material that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.

18 5. GREENGUARD Certified: Provide GREENGUARD Certified material. Profiles shall meet the requirements of GREENGUARD Certification Standards for Low-Emitting Products and GREENGUARD Product Emission Standard for Children & Schools.

19 6. Color Consistency: Provide components matched in accordance with SAE J-1545 - (Delta E) with a color difference no greater than 1.0 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.

20 **1.05 SUBMITTALS**

21 A. Product Data: Manufacturer's printed product data for each product indicated in this section.

22 B. Detail Drawings: Mounting details with the appropriate fasteners for specific project substrates.

23 C. Samples: Verification samples of corner guard, 8" (203mm) long, in full size profiles of each type and color indicated.

24 D. Manufacturer's Installation Instructions: Printed installation instructions for each corner guard.

25 **1.06 DELIVERY, STORAGE AND HANDLING**

26 A. Deliver materials in unopened factory packaging to the jobsite

27 B. Inspect materials at delivery to assure that specified products have been received.

28 C. Store in original packaging in a climate controlled location away from direct sunlight.

29 **1.07 PROJECT CONDITIONS**

30 A. Environmental Requirements: Install products in an interior climate controlled environment.

31 **1.08 WARRANTY**

32 A. Standard IPC Limited Lifetime Warranty against material and manufacturing defects.

33 **PART 2 – PRODUCTS**

34 **2.01 MANUFACTURER**

35 A. Acceptable Manufacturer: IPC Interior Protection Products and Decorative Surfaces

InPro Corporation, PO Box 406, Muskego, WI 53150, USA
Telephone: 800.222.5556, Fax: 888.715.8407
www.inprocorp.com

39 B. Substitutions: Not permitted

40 C. Provide all corner guard and wall protection from a single manufacturer.

41 **2.02 MANUFACTURED UNITS**

42 A. Corner Guard Profile

43 1. G2 Series Smooth Tape-on Corner Guard

44 1-1/2" (38mm) x 1-1/2" (38mm) 90 degree

45 Standard heights: 3' (.91m), 4' (1.22m), 8' (2.44m), 9' (2.74m) and 12' (3.66m).

46 Options: Custom heights available.

47 **2.03 MATERIALS**

48 A. Reformulated PETG with Biopolymer Blend: Corner Guard of .080" (2mm) thickness shall be extruded from chemical and stain resistant PETG.

49 **2.04 COMPONENTS**

50 A. Attachments

51 1. Tape: Factory applied double-faced foam tape.

52 2. Adhesive: Field applied heavy-duty adhesive.

53 **2.05 FINISHES**

54 A. Corner Guard Covers: Corner guard colors to be selected by the architect from the IPC finish selection.

55 **PART 3 – EXECUTION**

56 **3.01 EXAMINATION**

57 A. Examine areas and conditions in which the corner guard system will be installed.

58 1. Complete all finishing operations, including painting, before beginning installation of corner guard system materials.

59 2. Wall surface shall be dry and free from dirt, grease and loose paint.

60 **3.02 PREPARATION**

61 A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

62 **3.03 INSTALLATION**

- 63 A. General: Locate corner guard as indicated on approved detail drawings for the
appropriate substrate and in compliance with the IPC installation instructions. Install
64 corner guard level and plumb at the height indicated on the drawings.
65 B. Installation of G2 Series Smooth Tape-on Corner Guard:
1. Allow the corner guards to reach room temperature before installing. The wall
surface that the corner guards are to be applied must be dry and free of dirt,
dust, oil, loose paint wax and grease. Note: When adhering to textured or difficult
surfaces, such as stucco, glazed block or wall paper, use IPC# 535 Heavy Duty
Adhesive to adhere corner guards. Corner Guards should be ordered without
tape.
66 2. Installation with factory applied foam tape: Peel the paper release backing
from the tape-on corner guard. Starting at the bottom, position the corner guard
on the wall. Continue making contact between the corner guard and the corner
over the entire height of the corner guard.
67 3. Installation with Heavy Duty Adhesive: Cut a small opening in the spout of the
adhesive cartridge. Apply a continuous bead of adhesive on each wing of the
corner guard. Starting at the bottom, position the corner guard on the wall.
Continue making contact between the corner guard and the corner over the
entire height of the corner guard.
68 4. Apply firm pressure to the entire surface of the corner guard to ensure a firm
bond. An extension roller will aid this step. Note: Smooth Tape-on Corner Guards
are available without factory applied double-faced foam tape. When ordering,
denote with suffix "n" after the model number.
- 69 **3.04 CLEANING**
70 A. At completion of the installation, clean surfaces in accordance with the IPC clean-up
and maintenance instructions.

END OF SECTION

1 SECTION 115200 – STUDIO LIGHTING GRID

2 **PART 1 - GENERAL**

3 1.1 RELATED DOCUMENTS

- 4 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and
5 Division 1 Specification Sections, apply to this Section.

6 1.2 SUMMARY

- 7 A. Major Systems and Equipment: furnishing and installing the following major elements and associated
8 accessories:

- 9 1. Pipe Grid in Television Studio
10 2. Drapery Track
11 3. Draperies

- 12 B. Work Results:

- 13 1. The equipment installed as a result of this section shall result in a complete and working Studio
14 Lighting Pipe Grid.
15 2. Provide fully coordinated and engineered equipment, installation, supervision and commissioning
16 for the following major systems and associated accessories.
17 3. Provide all material, components, accessories and services required to provide the work as
18 specified herein, elsewhere in the project documents and/or as shown on related drawings.

- 19 C. Consult and coordinate with other affected work and contractors throughout the course of the project.

20 1.3 SUBMITTALS

- 21 A. Rigging Contractor's qualifications including the Project Manager's qualifications.

- 22 B. Product Data: Where standard manufactured parts are used, submit current product literature describing
23 component, manufacturer's recommended applications, load ratings, safety factors and dimensions.
24 Clearly indicate specific components and options.

- 25 1. Pipe
26 2. Pipe Splices
27 3. Wall Connection Hardware
28 4. Cross Clamps
29 5. Ceiling Connection Hardware
30 6. Drapery Track and associated hardware
31 7. Draperies

- 32 C. Shop Drawings: Provide WI State licensed Physical Engineer stamped drawings showing:

- 33 1. Pipe Grid Layout.
34 2. Complete, fully dimensioned, detailed fabrication drawings of all major components.
35 3. All requisite schematics, plans and sections indicating assembly and installation of components.
36 4. Indications by arrow and notes of any variations from Contract Documents.

- 37 D. Inventory - Provide an inventory of all equipment to be supplied, including quantities, manufacturer's part
38 number, reference to drawings, etc.

1 E. As-Built Documentation: Provide to the architect within 30 days of completion of work updated copies
2 of all drawings and documentation accurately reflecting the installation on site.

3 1.4 QUALITY ASSURANCE

4 A. All bidders submitting bids on the work of this section shall meet or exceed the quality of materials,
5 components and assemblies specified herein Bidders who do not comply with these performance
6 specifications shall refrain from submitting a bid.

7 B. Alternate Bids, Alternative Products shall be submitted to the Design Consultant 10 days prior to tender
8 closing. Alternative Bids can only be submitted as an alternate Bid to the specified base Bid Product.
9 Manufacturers that meet the performance criteria and are approved, as an alternate by the Design
10 Consultant shall be listed in an addendum.

11 C. All work specified under this section supplied and installed entirely by one Subcontractor using his own
12 forces.

13 D. Conform to applicable Building Code and Local Authority having jurisdiction and all other standards
14 noted.

15 E. Rigging Contractor Qualifications

- 16 1. Must meet requirements for Dealer membership in PLASA.
- 17 2. The Rigging Contractor shall employ riggers and project managers experienced in completing
18 work of similar size or scope.
- 19 3. The Rigging Contractor shall be a lighting systems contractor who regularly engages in the
20 furnishing and installation of systems of a similar nature, size, scope and complexity.
- 21 4. The Rigging Contractor shall employ ETCP Certified Riggers in the supervision of all work on
22 this project.
- 23 5. Rigging Contractor's site supervisor shall have OSHA 10 Hour certification.
- 24 6. The Rigging Contractor shall maintain throughout the course of this project and its warranty
25 period, all required business and professional licenses, certifications and insurance

26 1.5 WARRANTY

27 A. The Rigging Contractor shall provide a two year system warranty for the complete pipe grid. Within this
28 period, the Rigging Contractor shall be the owner's sole contact for remedy, repair or replacement of
29 deficiencies.

30 B. During the warranty period the Rigging Contractor shall respond to all hazardous situations within 24
31 hours, and corrective measures shall be taken within 72 hours.

32 **PART 2 - PRODUCTS**

33 A. Acceptable Rigging Contractor

- 34 1. Pursuant to the above requirements, the Rigging Contractor shall be:
 - 35 a. I. Weiss – Contact: Russ Dusek. 312-524-3687. russd@iweiss.com
 - 36 b. Chicago Flyhouse – Contact: Benjamin Cohen. 773-533-1590. bcohen@flyhouse.com

37 B. Rigging Contractor Requirements

- 38 1. Perform site survey within 30 days of contract award.
 - 39 a. Field Measurements to verify the location of pipe grid and location of any existing
40 obstructions that must remain.

- 1 b. Confirm condition of concrete ceiling.
- 2 c. Meet with general contractor's project manager to determine appropriate means of
- 3 delivering supplies to the jobsite as well as storage locations for materials delivered prior to
- 4 installation.
- 5 2. Provide and Install Pipe grid with 30 lb./ft uniform load rating, 90 lbs. maximum point load at
- 6 center of each span, and 2 ton maximum distributed working load:
- 7 a. 1.5" ID Schedule 40 Black Iron Pipe
- 8 b. Pipe Splices – Pipe splices to be 18" close fitted internal sleeves secured by two (2) bolts
- 9 perpendicular to floor on each side of joint. ¼" x 20 cap screws through-bolted with nylock
- 10 nuts. Holes 6" on center, 3" from ends.
- 11 c. All Bolts & Fasteners shall be Grade 8 or better. All bolted attachments shall have lock
- 12 washers or other approved self-locking fasteners.
- 13 d. Pipe Grid Cross Clamps – Shall be provided at every pipe intersection.
- 14 e. Wall Connection Hardware – Shall terminate each pipe at the wall.
- 15 f. Ceiling Connection Hardware – Grid shall be suspended from the ceiling as close as
- 16 possible to the ceiling without conflicting with other trades.
- 17 g. All hardware to be finished with flat black matte epoxy paint.
- 18 3. Provide Drapery Track for walk along operation with 60" radius corners, end stops, drapery
- 19 carriers with trim chains, and tow ropes on end carriers.
- 20 a. Track
- 21 1) Drapery track shall be H&H Specialties 300 Series Standard-Duty Curved Track
- 22 2) Track to be black anodized aluminum.
- 23 3) Provide 4 master carriers, plus single carriers for 44' of drapery. One single carrier
- 24 for each 1' of drapery.
- 25 4) Hanger fittings and clamps for attachment to pipe grid shall be spaced at 4' on
- 26 center maximum.
- 27 4. Provide two drapery panels, each 22' long, by 9'6" High (or 1" shorter than distance from bottom
- 28 of carrier to floor). To be manufactured of 20" Inherently Flame Retardant Black Velour with
- 29 50% additional box pleated fullness, hidden snap hooks at top, hem with weight tape at bottom,
- 30 and 2" side hems.

31 **PART 3 - EXECUTION**

- 32 A. Field Quality Control
- 33 1. Work under this section is to be executed by a crew supervised by an ETCP Certified Rigger.
- 34 2. Position all items accurately as indicated on drawings and true to plumb, line and level. Maintain
- 35 maximum headroom and clearances at all points.
- 36 3. Rigging Contractor shall keep a clean and neat worksite.
- 37 4. Questions regarding obstructions, schedule and coordination shall be resolved by the general
- 38 contractor in coordination with the architect.

- 39 B. Project Management
- 40 1. The Rigging Contractor shall designate a project manager.
- 41 2. The Rigging Contractor's project manager shall be the main contact between the Rigging
- 42 Contractor, manufacturers, architect, design team and contractors from contract award through
- 43 final sign off. The Rigging Contractor's project manager shall be the same person throughout the
- 44 entire course of the project, unless otherwise approved by the architect.

45 END OF SECTION 115200

SECTION 125520 – MANUAL CHAIN OPERATED SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Provide chain operated interior roller shades system, with related hardware to complete the installation
- B. Roller shades shall be mounted at head of window and underside of soffit.

1.3 SUBMITTALS

- A. Submit fully detailed drawings showing all components, finishes and perimeter construction conditions, installation, controls, and all applicable dimensions.
- B. Submit (2) samples of the specified fabric / shade cloth of each color and texture minimum size 8.5@ x 11@ (215mm x 280mm) for review.
- C. Submit sample of the specified sections of fascia, closure, pocket, housing, trim, roller tube, hembar, operating hardware, brackets, and side channel for review as required.
- D. Submit Reports of compliance to the following tests
 1. Fire tests: NFPA 701-89 SM, NFPA 701-89 LG Flat, NFPA 701-96 TM#1
 2. Toxicity: UPITT
 3. Fungal Resistance: ASTM G 21
 4. Bacterial Resistance: ASTM G 22
- E. Submit operating and maintenance instructions including, name and telephone number of local service company.

1.4 QUALITY ASSURANCE

- A. All bidders submitting bids on the work of this section shall meet or exceed the quality of materials, components and assemblies specified herein Bidders who do not comply with these performance specifications shall refrain from submitting a bid.
- B. Alternate Bids, Alternative Products shall be submitted to the Design Consultant 10 days prior to tender closing. Alternative Bids can only be submitted as an alternate Bid to the specified base Bid Product. Manufacturers that meet the performance criteria and are approved, as an alternate by the Design Consultant shall be listed in an addendum.
- C. All work specified under this section supplied and installed entirely by one Subcontractor using his own forces.

- D. Manufacturer shall have a minimum of fifteen (15) years experience in the manufacture of specified shading system.
- E. Shades to be installed by a firm, with a minimum of ten (10) years experience, specializing in the installation of shading systems.
- F. Conform to applicable Building Code and Local Authority having jurisdiction and all other standards noted.
- G. Install one complete operating sample with accessories on site. Review the installation before proceeding with the remainder of the work. Adjust sample installation to gain acceptance. Accepted work may form part of the final installation.

1.5 INSPECTION / PREPARATION

- A. Verify that all blocking and framing necessary to carry shade assembly hardware is properly installed and secure.
- B. Notify Owner in writing of any deficiencies in the work of other trades that would affect the window treatment system.
- C. Make accurate measurements at the site before fabrication. Check layout of glazing framing sections, spans, and loading capabilities.

1.6 DELIVERY STORAGE AND HANDLING:

- A. Do not deliver to site until areas to receive shades are completely finished, all walls and ceilings completed and painted.
- B. Deliver materials in original protective wrappings or containers, with manufacturers labels and sealed intact.
- C. Handle and store materials according to manufacturers recommendations protecting materials and finishes from damages, marring of finishes or soiling.

1.7 WARRANTY

- A. Provide a limited manufacturers warrantee from the Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: Ten (10) years
 - 2. Electronic Control Equipment: Five (5) Years
 - 3. Fabrics / Shade Cloth: Ten (10) Years
 - 4. Aluminum and steel coatings: Ten (10) Years
 - 5. Chain: Ten (10) Years
- B. Provide a limited installation warranty from Date of Substantial Completion, covering a period of one (1) year.
- C. Submit standard manufacturers' maintenance contract for review by Owner.

PART 2 - PRODUCTS

2.1 Roller Shade

A. Manufacturers:

1. Basis of Design: Nysan Shading Systems LTD of Hunter Douglas Contract Window Coverings
2. Equal Products by alternate manufactures subject to compliance with requirements to be submitted for approval.

B. Hardware

1. Shade Mounting Brackets:

a. Manual chain Operator

- 1) Unitized premoulded construction, on 71.5 mm x 76 mm (2.875" x 3"), 12 gauge, L shaped, coated steel mounting brackets
- 2) Operator assembly shall allow for continuous front or back-roll fascia across multiple shades (to a maximum length of 6.1m (20ft.) without exposed fasteners.
- 3) All shade brackets shall be shipped completely assembled from the factory.
- 4) A single manual chain operator as designed by the specified manufacturer shall be capable of operating a shade band up to 5.2m² (56 ft²) in total fabric area, 2.13m (7 ft) in width, or 2.44m (8 ft) in height, and shall be manufactured with a precise inertia brake mechanism capable of locking the shade panel or band at any point of travel. Chain operator type, Nysan Sunriser™, gear reduction operating hardware, manufactured with a precise inertia braking mechanism to stop shade at any desired point of travel.
 - a) Drive chain to be #10 stainless steel, tested strength of 41 kg (90lb.), to eliminate breakage of chain under normal usage.
 - b) Left hand, right hand or dual left and right operating systems.
 - c) Offset drive operators available (chain falls only on one side of bracket). Offset operators shall be standard with blackout fabric shades.
- 5) Mounting assembly shall allow for continuous front or back-roll fascia across multiple shades without exposed fasteners.
- 6) Shade roller tube shall be removable from mounting assembly without hardware removal.
- 7) All non-metal components shall be self-lubricating.
- 8) Shade hardware system shall provide for field adjustment or component replacement without removal of brackets, regardless of mounting location.
- 9) Shade hardware shall allow for a bottom-up or a sideways roller tube installation and removal without removing brackets

2. Roller Tube assembly:

- a. Top roller tube of one piece extruded aluminium tube, with 10 micron thick clear anodised coating, at the manufacturers recommended engineered diameter and wall thickness for maximum allowable deflection of L/700; Mill finish tubes will not be acceptable
- b. The roller tube shall be extruded with provision made for mechanical engagement with the operator and drive assembly.
- c. The extrusion shall have various channels to accept fabric attachment spline. The spline and slot reinforces the tube and retains the fabric and operating system.
- d. The spline will be an extruded vinyl profile, welded to the fabric band or panel, such that removal and re-installation of the fabric panels can occur without removing the roller tube and hardware. Fabric panels must be replaceable on site. Attachment of the fabric to the tube with double sided adhesive tapes, adhesives, staples, or rivets is not acceptable.

3. Hembars and Hembar Pockets:

- a. Round shaped profile, 15 mm (0.625") diameter, wall thickness engineered to weight requirements, in welded hembar pocket with open ends. Finished with coloured PVC round end caps.
 - 4. Fasteners:
 - a. Non-corrosive to manufacturers' recommendations.
 - 5. Fabrics: Select from Manufacturers standard options.
 - a. Basis of Design: Mesh = Nysan/Hunter Douglas – Green Screen Eco 300, 3% Openness, Color: Charcoal/Bronze
 - b. Basis of Design: Black-out = Nysan/Hunter Douglas – Avila Twilight, 0% Openness, Color: Chocolate
 - 6. Optional Accessories:
 - a. Aluminum Fascia:
 - 1) Back/Regular roll fascia:
 - a) Extruded aluminium alloy 6063-T5, prefinished, 105 mm x 45 mm x 1.6 mm wall thickness (4.13" x 1.77" x 0.063"), custom designed profile to fit onto remoulded end mounting brackets without exposed fasteners. Colour prefinished to match adjacent window framing or as selected by Consultant.
 - b) Fascia shall conceal the mounting hardware, power and control cables, drive mechanism, roller tube, and all fabric rolled on the tube
 - c) Fascia shall not fit snug against side channels to prevent thermal shock to the glazing system
- C. Aluminum Finishes:
 - 1. All exposed aluminium shall be clear anodised oxide finish according to AA-M12C22A31 or coloured to match light shelf.
 - 2. Unexposed aluminium unless otherwise specified: mill finish

PART 3 - EXECUTION

3.1 Fabrication:

- A. Shading system components manufactured and assembled allowing for installation techniques to suit project requirements.
- B. Finished assemblies shall be, square, true to size and free from distortion, twist, or other defects that could affect their strength, operation or appearance. Factory applied finish shall be uniform, smooth and without blemishes.
- C. The fabric shall be colourfast, retain its shape, not be affected by moisture or heat, and shall be non-flammable. Cut fabric to eliminate glare and reflection from shining surfaces while maintaining exterior view. The top of the fabric is retained in recessed spline of the shade roller and the bottom of the fabric is retained by the selected hem.

3.2 Installation:

- A. Install work by manufacturer's skilled tradesmen and installed in strict accordance with manufacturers recommendations.
- B. All items installed, plumbed, squared, rigidly coupled and adequately anchored, maintaining uniformed clearances, accurate alignment levels, and parallel with the window plane. Fabric shall not travel more than 3 mm (0.125") in either direction within channels after installation.

C. The solar screen and / or blackout fabric shall be pre-measured and manufactured off-site

3.3 Adjusting and Cleaning:

A. Adjust shades and operating components as required to ensure smooth and trouble free operation without binding.

B. Adjust shade and shade-cloth to hang flat without buckling or distortion.

C. Clean shades and exposed components.

D. Replace work, which cannot be satisfactorily repaired, adjusted, or cleaned

END OF SECTION 12552

SECTION 21 00 00 - FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

- A. The work indicated on this project involves modification of an existing automatic fire sprinkler system. The contractor shall coordinate all work, including system drainage, with building facility personnel.
- B. Fire Protection Contractor shall furnish all required calculations, design, drawings, material, equipment, labor and related items required to complete the work indicated on drawings and specifications.
 - 1. Fire Protection Contractor shall secure necessary approvals for work with Madison Fire Department and other local authorities prior to starting work.
- C. The work under this Section includes, but is not limited to the following:
 - 1. Provide all components for modification of the existing NFPA 13 wet automatic sprinkler system. Include, as required, shutoff valves, drain valve, test valve(s), piping, and all necessary components to leave a complete, operational, and approved system.
 - 2. Draining of existing 3rd floor fire protection system to accomplish work required.
 - 3. The modified existing wet automatic sprinkler system to provide complete, NFPA 13 compliant and approved automatic sprinkler system(s) to give fire suppression coverage to all remodeled areas and rooms.
 - 4. Coordination of work with all other trades.
- D. The Fire Protection Contractor shall acquire all approvals, as necessary, from Fire Department, and Local and State Agencies.

1.2 RELATED WORK

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

1.3 REFERENCE STANDARDS

- A. Local and State Codes and Regulations.
 - 1. National Fire Codes (NFC) published by NFPA; latest edition of standards listed:
NFPA 13 -Sprinkler Systems
 - 2. Local City of Madison Fire Department requirements.

1.4 QUALITY ASSURANCE

- A. Substitution of Materials: Refer to Division 1 of the Project Manual.

1.5 DESIGN STANDARDS

- A. Sprinkler system shall be designed and hydraulically calculated by the Contractor.
- B. Hydraulically calculate the sprinkler system pipe sizing to provide densities as listed on the drawings.

1.7 SUBMITTALS

- A. SHOP DRAWINGS
Submit shop drawings of all fire sprinkler system components.

B. PLANS

Submit contractor-prepared plans/drawings indicating:

1. Submit six (6) prints per NFPA 13 of complete, installation plans, working plans, shop drawings, hydraulic calculations, and manufacturer's data on devices, etc., indicating by model and number to be used, to the Architect/Engineer for review and approval.
2. Contractor shall obtain the necessary insurance underwriters, State and Local Fire Department approvals prior to submitting shop drawings.
3. Submittals shall be sent to the local Fire Chief or Fire Marshal for review prior to the Architect/Engineer. Include copy of approval letter in submission to Architect/Engineer.
4. No work shall commence until all approvals have been obtained. Contractor to allow sufficient time for the approvals.
5. Prepare drawings at minimum scale of 1/8" per foot for plans and 1/4" per foot or larger for details. Show all piping, lighting, equipment, ductwork, sprinklers, hangers, roof construction and occupancy of each area, including ceiling and roof heights.
6. Installation shall be coordinated with the latest architectural, structural, mechanical, plumbing and electrical drawings.
7. Contractor shall submit drawings to Engineer which have been reviewed and stamped "approved" by the authority having jurisdiction. No work shall commence until all approvals have been obtained. Allow sufficient time for the approvals.

C. AS-BUILT DRAWINGS

1. Maintain at the site an up-to-date marked set of as-built drawings which shall be corrected and delivered to the Architect upon completion of the work.
2. Furnish the Architect one(1) reproducible print and electronic PDF copy of corrected shop drawings, including plans, revised to show "as built" conditions.

PART 2 - PRODUCTS

2.1 PIPE

- A. Carbon steel pipe, black, thickness per NFPA 13, conforming to ASTM A53, A135, A795.
- B. Fire rated CPVC piping with solvent joints where approved by NFPA 13.
- C. Flexible stainless steel piping at sprinkler head terminations, UL listed and conforming to NFPA 13.

2.2 FITTINGS

- A. Malleable iron, Class 150, threaded, ANSI B16.3.
- B. Malleable or ductile iron, grooved end, 1000 lbin2 working pressure rating, UL listed or FM approved for automatic sprinkler.
- C. Ductile or malleable iron, plain end with EPDM gasket, carbon steel bolts or locking lugs UL listed or FM approved for automatic sprinkler, Grinnell "Sock-it" or Victaulic "FIT"
- D. Carbon steel, butt-welded, class 150, ASTM A234.
- E. Carbon steel, Class 150, flanged, ASTM A105.
- F. Fire rated CPVC, where applicable and approved by NFPA.

2.3 JOINTS

- A. Tapered pipe threads, with Teflon tape, ANSI B2.1.

- B. Mechanical coupling, EPDM gasket, UL listed or FM approved for automatic sprinkler.
- C. Solvent welded CPVC joints, where applicable and approved by NFPA.

2.4 SPRINKLERS

A. GENERAL

1. Manufacturer: Products of the following manufacturers determined to be equal by the Architect/Engineer will be accepted: Central Sprinkler Corporation, Tyco, Reliable, Star Sprinkler, Victaulic and Viking.
2. Fusible link or glass bulb type, cast brass or bronze construction. Provide heads with nominal 1/2" discharge orifice except where greater than normal density requires large orifice.
3. Select fusible link or glass bulb temperature rating to not exceed maximum ambient temperature rating allowed under normal conditions at installed location. Provide ordinary temperature (165 degree) glass bulb type.
4. White finished brass cover plate on concealed heads rated for 200 degree and 165 degree with cap.

B. FINISHED AREAS

1. Provide semi-recessed sprinkler heads in all office areas as shown, centered in lay-in ceiling tiles.

C. UNFINISHED AREAS

1. Provide upright sprinkler heads in all areas without suspended ceiling systems.

D. RATINGS

1. Provide standard response, ordinary hazard 165 degree rated heads in finished areas as indicated.
2. Use higher temperature-rated sprinkler heads in areas near heat sources, elevator equipment rooms, and elevator shafts.

E. VALVES

1. Manufacturers: Kennedy, Milwaukee, Nibco, Stockham, Victaulic, Viking, and Watts.

F. BALL VALVES:

1. 2" and smaller: Bronze, 2-piece, threaded or sweat ends, standard port, blowout proof stem, chrome plated ball, glass reinforced seats, UL approved @ 250 psi. Watts No. B-6000 UL.

G. GATE VALVES:

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

H. BUTTERFLY VALVES:

1. 2" and smaller: Bronze body butterfly valve, 175 psig, geared operator, visible position indicator, normally open tamper switch with double wire leads, Buna or Viton seat, stainless

steel disc and stem.

I. DRAIN VALVES:

- 1 3/4" min. two or three piece bronze body ball valve; threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 400 psig WOG, with hose thread outlet and cap.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install new portions of sprinkler system in accordance with requirements of NFPA 13 and local regulations of the local fire marshal.
- B. Modified system shall meet local regulations of the local fire marshal and NFPA 13 requirements.

3.2 TESTING

- A. Hydro-statically pressure test the fire sprinkler system piping as required in NFPA 13. Keep records of all testing for submission in Operation and Maintenance Manuals.

END OF SECTION

SECTION 22 00 00 - PLUMBING SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide plumbing where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
1. Domestic Hot and Cold Water Piping.
 2. Drain, Waste, and Vent Systems.
 3. Plumbing Fixtures and Trim.
- B. Related Work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 2. Cutting and patching existing walls and floors for plumbing piping are the responsibility of this contractor.
 3. Arrange for X-ray of proposed penetrations locations in structural floor prior to starting of drilling of holes -- coordinate locations with General Contractor and Owner prior to starting.
- C. Work of Other Sections:
1. Openings for new Plumbing work in new construction walls, floors, roof, ceiling, etc. shall be provided by the General Contractor. Location and size of these openings shall be the responsibility of the Plumbing Contractor.

1.02 GENERAL PROVISIONS

- A. This specification Section is a general description of the work requirements. The particular descriptions are not intended to be all-inclusive. Bidders shall also refer to the Drawings.
- B. Prior to submitting a bid, the Contractor shall call the Engineer's attention (in writing only) to any materials or items of work believed to be inadequate. Bidders are required to visit the premises, take measurements, inspect existing conditions and limitations, and obtain first hand information necessary to submit a bid. The intent of the Contract is to obtain complete system installations, tested, ready for operation. No extras will be allowed because Contractor's misunderstanding of the scope work involved.
- C. Everything essential for the completion of the work implied to be covered by these Specifications to make the system ready for normal and proper operation must be furnished and installed by this Contractor. Accordingly, any omission from either the plans or the Specifications, or both of details necessary for the proper installation and operation of the system shall not relieve this Contractor from furnishing such detail in full and proper manner.
- D. The Drawings show various details indicating the general arrangement of the plumbing work, sizes and locations of piping, equipment, etc. The said Drawings with figures, lettering, etc., shall be considered a part of these Specifications and no charge or alternation shall be made in any case unless ordered by the Engineer.
- E. In addition to the Plumbing work, refer to the Plumbing work shown on the general Construction Drawings of the building as being part of this Contract, unless specified to be done by other contractors.

1.03 QUALITY ASSURANCE

- A. Use adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as required to be complete the work of the Section in accordance, with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in the Contract Documents.
- C. In acceptance or rejection of installed work, the Architect or Engineer shall make no allowance for lack of skill on the part of the Workmen.
- D. For the actual field fabrication, installation and testing of the Plumbing work, use only thoroughly trained and experienced workmen complete familiar with the items required and manufacturer's current recommended methods of installation.
- E. Reference Standards:

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society of Testing and Material
FM	Factory Mutual
MCA	Mechanical Contractors Association
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation

1.04 CODES AND PERMITS

- A. This contractor must comply with building codes and other ordinances in force where the building is located as far as same apply to his work.
- B. Plumbing work shall meet all Federal, State, Local Codes, ordinances and utility regulations.
 - 1. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern when so directed by the Engineer.
- C. Plumbing Contractor must secure permits from proper offices and pay all legal fees as may be necessary for fulfilling the requirements of these specifications.
- D. Submit one (1) copy of all permits to the Owner.

1.05 COORDINATION

- A. Cooperate and coordinate with other trades to assure that all systems pertaining to the Plumbing work shall be installed in the best feasible arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.
- B. Arrange plumbing work in neat, well organized manner with piping and similar services running with primary lines of building construction, and with minimum of 8 foot overhead clearance, where possible.
- C. Locate equipment properly to provide easy access, and arrange entire plumbing work with adequate access for operation and maintenance.
- D. Give right-of-way to piping, which must slope for drainage.

- E. Where Plumbing work is to connect to existing, the Contractor must field verify all connection points before beginning any rough-in work. Verify gravity flow lines and proper invert elevations required prior to starting piping installation.

1.06 PLUMBING SYSTEM IDENTIFICATION

- A. General: Provide adequate marking of plumbing system and control equipment to allow identification and coordination of maintenance activities and maintenance manuals.
 - 1. Furnish and install adequate marking, tagging and labeling of all *accessible and exposed* Plumbing equipment, piping and control devices, per ANSI A13.1-1981. Accessible locations shall include all ceiling spaces above accessible ceilings.
- B. Piping: Identify piping once every 30 feet at each branch, at termination of lines, and near valve or equipment connections. Place flow directional arrows at each piping system for identification of flow direction. Provide lettering of the appropriate size to convey information on wrap-around signage, adhesive-backed or paint stenciled labels.
- C. Valves: Identify all valves with 1-1/2" diameter polished brass tags with stamp-engraved labels or plastic laminate tags. Prefix or color-code tags for each generic piping service. Prepare and submit valve tag schedule, listing location, service and tag description, and incorporate in Instruction Operations Manual.

1.07 FLOOR, WALL, ROOF AND CEILING OPENINGS

- A. The General Contractor will be required to leave openings in ceiling, floors, walls, roof, partitions, etc., as required to install the Plumbing work specified or shown on the Drawings. The Plumbing Contractor is responsible for correct size and location of his openings. Where penetrations through existing construction are required, they shall be the responsibility of the Plumbing Contractor.
 - 1. Pipe Sleeves: Schedule 40 black steel pipe, 1" larger than carrier pipe.
- B. The Plumbing Contractor shall set sleeves and anchors for all equipment, etc., and shall provide watertight seals on pipes through exterior walls, floors and roof and where noted on the Drawings.
- C. Pack annular space between sleeves and pipe with fiberglass insulation and seal with approved caulking materials. Where penetrations occur through fire-rated walls or floors, provide UL listed assembly for fire stopping and sealing penetrations. Seal openings with UL approved fire-resistive fire stop caulk/sealant .
 - 1. Fireproof plastic piping through fire-rated construction per approved UL listed assembly.
- D. Provisions for openings, holes and clearances through walls, floors, ceilings and partitions to be made in advance of construction of such parts of the building.
- E. If the Plumbing Contractor should neglect to inform the General Contractor of his opening requirements and that portion of the Building construction has been completed, the Plumbing Contractor shall pay the General Contractor for providing such openings.
- F. Make arrangements with various other contractors for all special framing, spacing and chases. Mason will leave chases in mason work, but Plumbing Contractor is responsible for correct size and location.

1.08 CUTTING AND PATCHING

- A. General: Refer to Division 1 General Requirements.
- B. Perform all cutting and patching required for complete installation of the HVAC systems, unless specifically noted otherwise. Provide all materials required for patching unless otherwise noted.

1. All cutting and patching necessary of structural members to install any Plumbing work shall not be done without permission, and then only carefully done under the direction of the Architect/Structural Engineer and General Contractor.
- C. The Contractor shall not endanger any work of other trades by demolition, cutting, digging or otherwise. Any cost caused by defective or ill-timed cutting and patching work shall be borne by the contractor responsible. Each contractor requiring cutting and patching shall hire men skilled in such cutting and patching to do the work.
1. All patching work in existing areas shall match existing work and restore the finish to its original condition in material, quality, texture, finish and color unless specifically noted or scheduled otherwise.

1.09 TESTS AND INSPECTIONS:

- A. All plumbing tests shall be conducted in the presence of and to the satisfaction of the Governing Authorities, Architect/ Engineer, and Owner or his authorized representative.
- B. The Plumbing Contractor shall be responsible for applying tests and ordering inspections as required by Federal, State and local Code and Inspection authorities.
1. All work shall remain exposed until it has been tested, inspected and approved.

1.10 TEMPORARY SERVICES

- A. Provide temporary services for all plumbing services to the existing facility to maintain function of sanitary, storm, natural gas and water services during the construction period.

1.11 EQUIPMENT ACCESS

- A. General: All valves, equipment and accessories shall be installed to permit access to equipment for maintenance, servicing or repairs. Relocation of piping, or equipment to accomplish equipment access shall be completed by this Contractor at no additional cost.
- B. Location: Provide access doors where equipment is located in chases or inaccessible locations. Access panels shall be furnished by this Contractor and installed by the specific trade responsible for the material in which the access panels are installed.
- C. Construction: Access doors in fire-rated construction must have UL label. Access doors shall be of size to provide adequate access to equipment concealed in wall, ceiling and furred-in spaces. Milcor or approved equal, 14-gauge steel frame and door, prime-coated, except stainless steel in areas subject to excessive moisture.

1.12 GUARANTEE

- A. All material and workmanship must be new and first class in every respect; the plumbing equipment must be turned over to the owner in complete working order and free from mechanical or performance defects.
- B. The Plumbing Contractor must guarantee all labor and materials for one (1) year from the completion of the plumbing system. Maintain and repair plumbing equipment for the above period, unless such defects are clearly the result of bad management after plumbing system is turned over to the Owner.
- C. Before final acceptance of the plumbing work, the Plumbing Contractor shall have the entire apparatus and system in complete and satisfactory operation and shall maintain same in satisfactory and continuous operation for a period of ten days prior to the date of acceptance; fuel to be furnished by Owner.

1.13 SUBMITTALS

- A. Refer to Division 1 for additional submittal requirements.
- B. The Plumbing Contractor will be held responsible for correction of work deemed necessary by the Engineer due to proceeding with the work without shop drawings that have the Architect/Engineers final approval.
- C. Shop drawings shall include data on physical dimensions, gauges, materials of construction and capacities.
 - 1. Incomplete drawings will be disapproved.
- D. This Contractor will be responsible for all figures and dimensions shown on the shop drawings. Approval of shop drawings describing equipment that cannot fit in the space allotted does not relieve this Contractor from providing equipment that will meet the space requirements.
- E. Submit six (6) copies or electronic PDF copy of shop drawings to the Architect/Engineer for approval, with complete detail for all equipment, materials, etc., to be furnished and installed for this project as follows:
 - 1. Valves.
 - 2. Pipe and piping specialties.
 - 3. Insulation systems.
 - 4. Plumbing fixtures.
 - 5. Instructions and O&M manuals(2 copies).
 - 6. As-built Drawings(1 copy).

1.14 HOUSEKEEPING AND CLEANUP

- A. Periodically as work progress and/or as directed by the Architect/Engineer, the Contractor shall remove waste materials from the building and leave the area of the work room clean. Upon completion of work remove all tools, scaffolding, broken and waste materials, etc., from the site.

1.15 INSTRUCTIONS AND MANUALS

- A. Upon completion of the installation, but before final acceptance of the system, the Plumbing Contractor shall instruct the Owner on the care and operation of all parts of the Plumbing system.
- B. Assemble two (2) complete sets of manufacturer's printed operating and maintenance instructions for all mechanical equipment and installed under this contract. Prepare in bound copies complete with index tabs. Information must include parts lists, equipment warranties, and wiring diagrams. Submit bound copies to Architect for disbursement.

1.16 AS-BUILT DRAWINGS

- A. During construction maintain a set of prints showing installed as-built work for the project.
- B. Upon completion of construction before final acceptance, provide a set of as-built drawings to the Architect/Engineer.

PART 2 - PRODUCTS

2.01 DOMESTIC WATER PIPE SCHEDULE

- A. Above Ground Piping:

1. Type 'L' copper water tube, H(hard drawn) temper, ASTM B88; with cast copper fittings, ANSI B16.18; wrought copper fittings, ANSI B16.22; lead-free(less than 0.2%) solder, ASTM B32; flux ASTM B813.
2. PEXa piping - Crosslinked Polyethylene, ASTM F876 & ASTM F877, insert type memory fittings. Wisconsin DSPS approved.
3. Mechanically formed brazed tee connections may be used in lieu of specified copper fittings.

2.02 DRAIN, WASTE AND VENT PIPE SCHEDULE

A. Interior Above Ground:

1. Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with casketed neoprene joints.
2. Hub-less cast iron soil pipe and fittings, CISPI 301; with no-hub couplings, CISPI 310.
3. PVC plastic pipe, Schedule 40, Class 12454-B(PVC 112), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.
4. Galvanized steel vent pipe, Schedule 40, zinc-coated, ASTM 120 or 53 Grade B; malleable iron threaded fittings, zinc-coated.
5. Type "DWV" copper water tube, H(hard drawn) temper, ASTM B88; with cast copper drainage fittings(DWV), ANSI B16.23; wrought copper drainage fittings(DWV) , ANSI B16.29; lead-free(less than 0.2%) solder, ASTM B32; flux, ASTM B813.

2.03 VALVES

A. Approved Manufacturers:

1. Conbraco Apollo;
2. Milwaukee;
3. Watts;
4. Nibco.

B. Check valves:

1. 2" and smaller: Bronze, screwed, Y-pattern, 200# WOG, swing check type.

C. Ball valves:

1. 2" and smaller: Two or Three piece, bronze-body, chrome-plated bronze ball, Teflon seat and packing, 400 pig WOG, with stem extensions on insulated piping. Appollo 70-200 series.

2.04 PIPE HANGERS

A. Piping:

1. Split ring hangers with supporting rods.
2. Adjustable clevis.

B. Multiple or Trapeze Hangers:

1. Steel channels with welded spacers and hanger rods.

C. Copper Pipe Supports:

1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper-plated or polyvinylchloride(PVC)-coated.
2. Where steel strut supports are used, provide isolation collar between supports/clamp and copper piping.

D. *Approved Manufacturers:* Fee and Mason, B-line, Grinnell or approved equal.

2.05 CLEANOUTS

A. *Interior Floors:* Smith 4930-PB square nickel-bronze top.

B. *Finished walls:* Smith #4532 stainless steel with access plate and screw.

C. *Approved Manufacturers:* Josam, Smith, Wade, Zurn or approved equal.

2.06 ACCESS

A. *General:* All piping, conduit and accessories shall be installed to permit access to equipment for maintenance. Any relocation of piping, equipment or accessories required to provide maintenance access shall be accomplished by the Contractor at no additional cost.

B. *Removable Access Plates:* Where only hand access is sufficient for valve access, provide removable plate-type access unit of minimum size which will facilitate required access.

1. Provide units of type, style, design, material and finish appropriate for location and exposure in each instance.
2. In exposed surfaces of occupied spaces provide round plate units, flush floor units and frameless low-profile wall units, primed-for-paint in painted surfaces and polished chrome or stainless steel finish in other surfaces.

C. *Walls:*

1. Smith #4767 flush wall stainless steel cover plate with screw latch lock in finished tile walls at wet locations.
2. Smith #4760 or #4765 with bonderized prime-coated steel face and screw latch lock in walls of other finished rooms.

D. *Ceilings:*

1. Provide Smith #4765 flush ceiling bonderized prime-coated steel face with screw latch lock.

E. *Floors:*

1. Smith #4910 with aluminum or nickel-bronze non-skid top.

2.07 WATER HAMMER ARRESTORS

A. Provide Smith #5000 series or equal, stainless steel or air chambers at each fixture group utilizing a flush valve or fast closing solenoid valve, as sized and recommended by the manufacturer.

B. *Approved Manufacturers:* Josam, PPP, Smith, Wade, Zurn or approved equal.

2.08 HANDICAPPED INSULATION

A. Where shown on the Drawings or required by governmental agencies having jurisdiction, provide "Truebro" insulation system or approved equal on exposed hot and cold water supply piping, waste tailpiece and trap at lavatories requiring ADA compliance.

2.09 PIPE INSULATION

A. *General:* Provide composite piping insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) with ratings not exceeding flame spread of 25 and a smoke developed of 50 in active return air plenums. Ratings in all other areas shall not exceed a flame spread of 25 and a smoke

developed of 150 (test method ASTM E-84). Comply with all codes regarding the use of foam insulation.

B. Insulate piping located in interior space, including (but not necessarily limited to) the following services:

1. Interior cold and hot domestic water piping.

C. Insulate each piping system with one of the following types and thickness of insulation, except as otherwise indicated (Installer's option where more than one type is indicated).

1. Fibrous Glass: Minimum density 3 lb./cu.ft., thermal conductivity of not more than 0.23 at 75 degrees F mean temperature, suitable for temperatures to 450 degrees F. Kraft-reinforced, foil-vapor barrier, laminate all-service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of 0.02 perms and minimum beach puncture resistance of 50 units.

2. Elastomeric Insulation: Closed-cell type, with minimum nominal density of 5.5 lbs./cu.ft., thermal conductivity shall be not more than 0.27 at 75 degrees F mean temperature, and maximum water vapor transmission of 0.17 perm/inch. The material shall be suitable for a temperature range from 220 degrees F to minus 40 degrees F.

D. Insulation Installation Schedule:

	<u>Service</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>
1.	Hot Water Piping	Less than 1"	1"
2.	Cold Water Piping	Less than 1"	1/2"

2.10 FIXTURES AND EQUIPMENT

A. General: Provide plumbing fixture, trim, and equipment as shown on the "**Fixture and Equipment Schedule**" on the Contract Drawings, and as specified herein.

B. All vitreous chinaware and porcelain fixtures shall be select quality.

1. All wastes and supplies for fixtures, except as otherwise specified or required, shall turn back into walls.

C. All trim, except as otherwise specified, shall be constructed of brass. Finish shall be polished chrome, except where concealed (inside cabinets, etc.).

D. Faucets shall have replaceable control assemblies or replaceable washers and seats.

E. Exposed waste fittings shall be constructed of 17 gauge tubular brass. Slip joints are permitted only on the fixture side of the trap.

F. All fixtures with non-accessible traps such as bathtubs, showers, floor drains, shall have a completely removable stopper or grate in order to be accessible for cleanout.

G. Quarter-turn (1/4) ball valve type fixture stops shall be installed at each fixture. It is the Contractor's option to install straight or angle type. All stops are to have a minimum of 1/2" inlets with flexible riser and loose key handles where exposed to the public.

1. All shower/bath valves are to have integral stops.
2. All loose stops shall be from the same manufacturer.

H. Approved manufacturer's for Stainless Steel Sinks:

1. Dayton/Just.
2. Elkay.

I. Approved manufacturers for Sink and Lavatory Fittings:

1. American Standard.
2. Chicago faucet.
3. Delta.
4. T&B Brass.
5. Symmons.

J. Approved manufacturers for Supplies, Stops and Traps:

1. McQuire Manuf.
2. Brass Craft.
3. Chicago Faucet.
4. Dearborn Brass.

2.11 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PLUMBING SYSTEM LAYOUT

- A. Lay out the plumbing system in careful coordination with the Drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system.
- B. Follow the general layout shown on the Drawings in all cases except where other work may interfere.
- C. Lay out pipes to fall within partition, wall, or roof cavities, and to not require furring other than that shown on the Drawings.
- D. Where work is to connect to existing, Plumbing contractor must field verify all connection points before beginning any rough-in work. Verify all connecting invert elevations and flow lines of new work connected to existing gravity drainage.

3.03 INSTALLATION OF PIPING AND EQUIPMENT, GENERAL

A. General:

1. Proceed as rapidly as the building construction will permit.
2. Thoroughly clean items before installation. Cap pipe openings to exclude dirt until fixtures are installed and final connections have been made.
3. Cut pipe accurately, and work into place without springing or forcing properly clearing window, doors, and other openings. Excessive cutting or other weakening of the building will not be permitted.
4. Show no tool marks or threads on exposed plated, polished, or enameled connections from fixtures. Tape all finished surfaces to prevent damage during construction.

5. Make changes in directions with fittings; make changes in main sizes with eccentric reducing fittings. Unless otherwise noted, install water supply and return piping with straight side of eccentric fittings at top of the pipe.
6. Run horizontal sanitary piping at a uniform grade of 1/4" per ft., unless otherwise noted. Run horizontal water piping with an adequate pitch upwards in direction of flow to allow complete drainage.
7. Provide sufficient swing joint, ball joints, expansion loops, and devices necessary for a flexible piping system, whether or not shown on the Drawings.
8. Support piping independently at pumps, coils, tanks, and similar locations, so that weight of pipe will not be supported by the equipment.
9. Pipe the drains from pump glands, drip pans, relief valves, air vents, and similar locations, to spill an open sight drain, floor drain, or other acceptable discharge point, and terminate with a plain and unthreaded pipe 6" above the drain.
10. Securely bolt all equipment, isolators, hangers, and similar items in place.
11. Support each item independently from other pipes. Do not use wire for hanging or strapping pipes.
12. Provide complete dielectric isolation between ferrous and non-ferrous metals.
13. Provide union and shut off valves suitably located to facilitate maintenance and removal of equipment and apparatus.

B. Equipment access:

1. Install piping, equipment, and accessories to permit access for maintenance. Relocate items as necessary to provide such access, and without additional cost to the Owner.
2. Provide access doors where valves, motors, or equipment requiring access for maintenance are located in wall or chases or above ceilings. Coordinate location of access doors with other trades as required.

3.04 PIPE JOINTS

A. Copper tubing:

1. Cut square, remove burrs, and clean inside of female fitting to a bright finish.
 - a. Apply solder flux with brush to tubing.
 - b. Remove internal parts of solder-end valves prior to soldering.
2. Provide dielectric unions at points of connection of copper tubing to ferrous piping and equipment.
3. For joining copper tubing, use the following:
 - a. Water piping 3" and smaller: 95-5 solder;
 - b. Water piping larger than 3": "Sil-fos" brazing;
 - c. Underground: "Sil-fos" brazing.

B. Screwed piping:

1. Deburr cuts.
 - a. Do not ream exceeding internal diameter of the pipe.
 - b. Thread to requirements of ANSI B2.1.
2. Use Teflon tape on male thread prior to joining other services.
3. Use litharge and glycerin on joint prior to cleaning for air and oil piping.

C. Leaky joints:

1. Remake with new material.
2. Remove leaking section and/or fitting as directed.
3. Do not use thread cement or sealant to tighten joint.

D. PEX Piping: Installed per ASTM F-1807

1. Provide copper type L manifolds, where manifold distribution is used with labeled quarter turn ball valve stops for each service line.

2. Install piping and fittings per manufacturers recommendations.

3.05 PIPE SUPPORTS

- A. Support suspended piping with clevis or trapeze hangers and rods.
- B. Space hangers and support for horizontal steel pipes according to the following schedule:

<u>Pipe size:</u>	<u>Maximum spacing on centers:</u>
1-1/4" and smaller:	8'-0"
1-1/2" to 3":	10'-0"

- C. Space hangers and supports for horizontal copper tubing according to the following schedule:

<u>Tube size:</u>	<u>Maximum spacing on centers:</u>
1" and smaller:	6'-0"
1-1/2":	7'-0"

- D. Provide sway bracing on hangers longer than 18".
- E. Support vertical piping with riser clamps secured to the piping and resting on the building structure. Provide at each floor unless otherwise noted.
- F. Provide insulation continuous through hangers and rollers. Protect insulation by galvanized steel shields.
- G. Arrange pipe supports to prevent excessive deflection, and to avoid excessive bending stress.

3.06 SLEEVES AND OPENINGS

- A. Provide sleeves for each pipe passing through walls, partitions, floors, roofs, and ceilings.
 1. Set pipe sleeves in place before concrete is placed.
 2. For uninsulated pipe, provide sleeves two pipe sizes larger than the pipe passing through, or provide a minimum of 1/2" clearance between inside and outside of the pipe.
 3. For insulated pipe, provide sleeves of adequate size to accommodate the full thickness of pipe covering, with clearance for packing and caulking.
- B. Caulk the space between sleeve and pipe or pipe covering, using a noncombustible, permanently plastic, waterproof, non-staining compound which leaves a smooth finished appearance, or pack with noncombustible asbestos cotton, or fiberglass to within 1/2" of both wall faces, and provide the waterproof compound described above.
- C. Finish and escutcheons:
 1. Smooth up rough edges around sleeves with plaster or spackling compound.
 2. Provide 1" wide chrome or nickel plated escutcheons on all pipes exposed to view where passing through walls, floors, partitions, ceilings, and similar locations.
 - a. Size the escutcheons to fit pipe and covering.
 - b. Hold escutcheons in place with set screw.

3.07 CLEANOUTS

- A. Secure the Architect's approval of locations for cleanouts in finished areas prior to installation.
- B. Provide cleanouts of same nominal size as the pipes they serve; except where cleanouts are required in pipes 4" and larger provide 4" cleanouts.

- C. Make cleanouts accessible. After pressure tests are made and approved, thoroughly graphite the cleanout threads.

3.08 VALVES

- A. Provide valves in water and gas systems. Locate and arrange so as to give complete regulation of apparatus, equipment, and fixtures.
- B. Provide valves in at least the following locations:
 - 1. In branches and/or headers of water piping serving a group of fixtures.
 - 2. On both sides of apparatus and equipment.
 - 3. For shutoff of risers and branch mains.
 - 4. For flushing and sterilizing the system.
 - 5. Where shown on the Drawings.
- C. Locate valves for easy accessibility and maintenance.

3.09 PLUMBING FIXTURE INSTALLATION

- A. Installation:
 - 1. Set fixtures level and in proper alignment with respect to walls and floors, and with fixtures equally spaced.
 - 2. Provide supplies in proper alignment with fixtures and with each other.
- B. Grout wall and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.
- C. Caulk deck-mounted trim at the time of assembly, including fixture and casework mounted. Caulk self-rimming sinks installed in casework.

3.10 DISINFECTION OF WATER SYSTEMS

- A. Disinfect hot and cold water systems.
 - 1. Perform disinfection under the Architect's observation. Notify the Architect at least 48 hours prior to start of the disinfection process.
 - 2. Upon completion of disinfecting, secure and submit the Certificate of Performance, stating system capacity, disinfectant used, time and rate of disinfectant applied, and resultant residuals in ppm at completion.
 - 3. Use disinfectant method approved by the Architect.
- B. When disinfection operation is completed, and after final flushing, secure an analysis by a laboratory approved by the Architect, based on water samples from the system, showing test negative for coli-aerogene organisms. Provide a total plate count of less than 100 bacteria per cc, or equal to the control sample.
- C. If analysis results are not satisfactory, repeat the disinfection procedures and retest until specified standards are achieved.

3.11 OTHER TESTING AND ADJUSTING

- A. Provide personnel and equipment, and arrange for and pay the costs of, all required tests and inspections required by governmental agencies having jurisdiction.
- B. Where test show materials or workmanship to be deficient, replace or repair as necessary, and repeat the tests until the specified standards are achieved.
- C. Adjust the system to optimum standards of operation.

END OF SECTION

SECTION 23 05 00 - HVAC GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. HVAC work includes:

1. Furnish all labor and materials necessary for the complete installation of heating, ventilating and air conditioning system as shown on the drawings and/or specified herein.
2. Drawings: Refer to H-Series drawings for graphic representations, schedules and notations showing HVAC work.
3. Specifications: Applicable portions of Division 1 govern all work under this Section. Refer to Division 23 Sections for primary technical specifications of HVAC work, as listed below:

23 05 00	HVAC General Provisions
23 05 90	Testing Adjusting and Balancing
23 06 00	Pipe and Pipe Fittings
23 06 30	Piping Specialties
23 09 10	Supports and Anchors
23 10 00	Valves
23 25 00	Mechanical Insulation
23 63 00	Water Treatment
23 74 00	Terminal Air Distribution Units
23 84 00	Ductwork
23 86 00	Ductwork Accessories
23 87 00	Air Outlets and Inlets
23 90 00	Controls and Instrumentation
23 96 00	Starting of Mechanical Systems

4. HVAC demolition and remodeling.
5. Equipment structural supports, prime painted.
6. Motors for all HVAC equipment.
7. Secure and pay all fee
8. Test, adjust and balance HVAC systems.
9. Cutting and patching existing conditions for HVAC equipment by the HVAC Contractor.

1.2 RELATED DOCUMENTS

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

B. Work by HVAC Contractor :

1. Field painting of all exposed piping, ductwork, hangers, supports and related metal work, unless noted specifically in the Drawings or Specifications herein.
2. Building provisions for all recesses and chases intended as equipment space for ductwork and piping in new construction.
3. Lintels and openings for ducts and piping through existing walls, floors and ceilings.
4. Line voltage (greater than 100 volts) wiring, conduit and connections.
5. All equipment starters not furnished as integral part of HVAC equipment.

D. Coordination of Work:

1. General: Contract Documents are diagrammatic in showing certain physical relationships which must be established within HVAC work, and in its interface with other work including electrical work, and that such establishment is the exclusive responsibility of the Contractor.

2. Arrange HVAC work in neat, well organized manner with piping and similar services running parallel with primary lines of building construction, and with minimum of 7 foot overhead clearance where possible.
3. Give right-of-way to piping which must slope for drainage.
4. Advise other trades of openings required in their work for subsequent move-in of large units of HVAC work.
5. Install all sensor wells, dampers and valves provided by the Temperature Control Contractor.

1.3 SHOP DRAWINGS AND SAMPLES

- A. The Contractor shall submit to the Architect for approval, shop drawings, giving details, dimensions, capacities, accessories, wiring diagrams, etc., of all materials as indicated in respective specification sections.
- B. All shop drawings shall include proper identification of equipment by name and/or number, as indicated in the specification and/or shown on the plans.
- C. Shop drawings shall be submitted for approval as soon as practicably possible after award of contract. Shop drawings must be approved before installation of materials and equipment. Drawings shall be submitted in accordance with the requirements outlined in Division 1 of the Specifications.
- D. The examination and approval of shop drawings shall not relieve the Contractor from any obligation to perform the work strictly in accordance with the Contract Drawings and Specifications. The responsibility for errors in shop drawings shall remain with the Contractor.
- E. Electronic shop drawing submittals require file labeling to match specification section contained and all equipment identified properly compatible with construction documents. All shop drawings improperly labeled and identified will be returned for corrections.

1.4 QUALITY ASSURANCE

- A. Qualifications of Installers: For the actual fabrication, installation and testing of work under this Section, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.
- B. In acceptance or rejection of installed work, the Architect will make no allowance for lack of skill on the part of the workmen.
- C. Reference Standards: Specifically, for HVAC work in addition to standards specified in individual work section, the following standards are imposed, as applicable to work in each instance:

AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AGA	American Gas Association
AMCA	Air Movement and Control Association
ANSI	American National Standard Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
IEEE	Institute of Electrical and Electronics Engineers
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code

NEMA National Electric Manufacturer's Association
NFPA National Fire Protection Association
SMACNA Sheet Metal and Air Conditioning Contractor's National Association
UMC Uniform Mechanical Code
UL Underwriter's Laboratories

All federal, state, local codes, ordinances and utility regulations.

D. Environmental design conditions for all occupied areas are as follows:

	<u>Winter</u>	<u>Summer</u>
Inside:	70 degrees F	74 deg. F 50% RH
Outside:	-10 degrees F	91 deg. dbF/75 deg. wbF

E. Approval of Materials: Refer to General Conditions, Supplementary General Conditions and other requirements of Division 1 for approval of materials and requirements of substituted equipment.

1.5 JOB CONDITIONS

A. Building Access: Arrange for the necessary openings in the building to allow for admittance of all HVAC equipment.

B. Temporary Services: No service shall be interrupted or changed without the prior approval of the Owner. Refer to Division 1 requirements.

C. Compatibility: Provide products which are compatible with other products of HVAC work, and with other work requiring interface with HVAC work. Provide products with proper or correct power characteristics, fuel-burning characteristics and similar adaptation for Project. Coordinate selections from among options for compatibility of products. Design and layout is based on equipment scheduled on drawings or in specifications.

1. Contractor shall coordinate installation of equipment supplied by other approved equal manufacturers and shall make necessary field modifications to allow for installation of this equipment at no additional expense to the Owner.

D. Record Drawings: Refer to Division 1 requirements.

1.6 REMODELING REQUIREMENTS

A. Prebid Survey: HVAC Contractor shall survey the job site before submitting his bid to determine the extent of areas requiring demolition, relocating and remodeling. The extent of equipment and materials to be removed. Routings for existing and new piping services and systems. Examine accessibility, material storage and working space available.

B. Maintenance of Service: The building will be continuously occupied during the construction period except as noted. Special efforts shall be made to avoid interference with building functions. Consult with the Owner prior to performing work in public areas of building or to turn off services, so that Owner can advise as to most suitable time for the necessary interruptions. All such work and interruptions to services shall be performed at times, which are approved by the Owner.

C. Demolition: Carefully examine the present building site, together with all of the drawings and specifications. Within areas involving remodeling, each Contractor shall be responsible for removal of, relocation of, or revisions to existing equipment, wiring, piping, fixtures and all other existing facilities under appropriate headings of his work, which is necessary to accomplish the final arrangement indicated on the Architect's plans. To assist the Contractor in meeting the above requirement, the drawings note certain of these items, but the absence of such notes shall not limit the responsibility of each Contractor to perform all work as described in this paragraph.

- D. Disposition of Demolition Materials and Equipment: Materials demolished or removed shall become the property of the Contractor and shall be removed from the site, except items, which are to be reused or are specifically noted as remaining the property of the Owner.
- E. Cutting or Patching Existing Facility:
 - 1. HVAC Contractor will be required to do all remodeling, cutting and/or construction removal and all patching or construction replacement as required for his work except for specific cutting and patching described in the documents as being performed by a specific Contractor.
 - 2. HVAC Contractor shall not endanger any work by any demolition, cutting, digging or otherwise. Any cost caused by defective or ill-timed work shall be borne by the contractor responsible.
 - 3. HVAC Contractor requiring cutting and patching shall hire men skilled in such cutting and patching to do the work.
 - 4. All new work in existing areas shall match existing work in material, quality, texture, finish and color unless specifically noted or scheduled otherwise.

1.7 DEMOLITION

- A. The Contractor is responsible for removal and relocation of all existing HVAC equipment and related items affected by the remodeling area.
- B. To assist the Contractor in meeting the above design intent, the drawings note certain of these items, but the absence of such notes shall not limit responsibility of the Contractor to perform all demolition work as required to accomplish new design plan.
- C. Contractor shall coordinate his remodeling efforts with the building functions and avoid interference wherever possible. All such interruptions of existing services shall be performed at times which are approved by the Postmaster.
- D. Interruption of domestic water service during the course of demolition and new work shall be minimized. Interruptions of domestic water service shall be coordinated and approved by the Postmaster, prior to disconnecting or turning off.
- E. All existing demolished or removed equipment shall be removed from site and disposed of properly at the cost of the Contractor.

PART 2 - PRODUCTS

2.1 ELECTRICAL PROVISIONS OF HVAC WORK

- A. General: The electrical provisions of HVAC work, where indicated to be furnished integrally with HVAC equipment, can be summarized, but not by way of limitation, to include the following: 1) Motors, 2) Motor starters, 3) Control switch, pilot lights, interlocks, and similar devices, and 4) Drip pans to protect electrical work.
 - 1. Temperature Control Contractor (T.C.C.) shall furnish and install control wiring as part of the Temperature Control Contractor work.
 - 2. Power wiring, connections to equipment, motor control wiring and related work by Electrical Contractor.
 - 3. Motor starters, disconnects, relays, pushbuttons, pilot lights and related motor control items not furnished integrally with HVAC equipment shall be furnished by Electrical Contractor.
 - 4. Provide equipment list, locations and wiring diagrams to Electrical Contractor for all HVAC equipment requiring electrical connections.

B. Motors:

1. Standards: Where not otherwise indicated, comply with applicable provisions of the NEC, NEMA Standards, and sections of Division 16 of specifications. All motors 1 HP and larger shall be NEMA Premium Efficiency motors meeting or exceeding values tested in accordance with IEEE Standard 112, Method B procedures as stated in NEMA MG 1-12.53a and shall be EPACT approved.
2. Temperature Rating: Class B insulation for 70 degree C temperature rise, except where otherwise indicated or required for service.
3. Phases and Current: 1/6 HP and smaller is Contractor's option; up to 1/2 HP, capacitor-start, 120 or 277 volt, 60 cycle single-phase; 1/2 HP and larger, squirrel-cage induction NEMA rated 208 or 477 volt, three-phase, 60 cycle.
4. Service Factor: 1.15 for motors in drip-proof enclosures, all other enclosures to have minimum 1.0 service factor.
5. Construction: Select motors for conditions in which they will be required to perform: i.e., general purposes, splash proof, explosion proof, standard duty, high torque or other special type as required by manufacturer's recommendations. Enclosures shall be of the type recommended by manufacturer for the specified application.
6. Frames: NEMA Standard for horsepower specified.
7. Bearings: Permanently lubricated and sealed ball bearings, 1/8 HP and less may be shaded pole type permanently oiled unit bearings.
8. Overload Protection: Built-in thermal; with internal sensing device for stopping motor, and for signaling where required.

C. Starters, Switches: All starters shall have thermal overload and low voltage protection, and shall comply with Electrical Division 16 sections of specifications.

D. Wiring Connections:

1. Motors: Wired connections in flexible conduit, except where plug-in electrical cords are indicated and permitted by governing regulations.
2. General Wiring: Comply with applicable provisions of Electrical Division 16 sections of specifications.

E. Drip Pans: Furnish drain pans below piping which passes directly above electrical work. Locate pan immediately below piping and extend a minimum of 6 inches on each side of piping and lengthwise 18 inches beyond equipment. Fabricate of galvanized sheet metal or copper with 2 inch deep watertight pan, copper drain piping and drain valve

2.2 FLOOR, WALL, ROOF AND CEILING OPENINGS

A. Provide sleeves for pipes and ducts passing through masonry, concrete or other similar construction. Openings for pipes shall be 1" larger in diameter than pipe passing through, including insulation, where indicated. Openings for ductwork shall be 1/2" larger on all sides than size of duct passing through, including duct insulation, where indicated. Coordinate additional space requirements for fire or smoke damper installation.

1. Pipe sleeves: Standard weight steel pipe.
2. Duct sleeves: 24 gauge galvanized sheet metal, unless noted otherwise.

B. Grout openings between sleeves and concrete or masonry walls and floors with sand-cement mortar consisting of one part portland cement and three parts sand, by volume. Add sufficient water to make a stiff placeable mortar.

C. Close joints between sleeves and non-masonry walls and floors with suitable caulking applied over polyethylene foam backer, compatible with caulking used.

- D. Pack annular space between sleeves and insulation pipe or ducts with glass fiber blanket insulation and seal with Urethane caulking compound.
- E. Where penetrations occur through fire rated walls or floors, fill annular space with fire-resistive materials in compliance with a UL approved fire rated assembly. Seal annular space through fire rated walls or floors with a UL listed fire resistant sealant and materials in conjunction with the fire rated assembly.

2.3 CUTTING AND PATCHING

- A. General: Perform all cutting and patching required for complete installation of HVAC systems, unless specifically noted otherwise. Provide all materials required for patching unless otherwise noted. All cutting and patching necessary of structural members to install any HVAC work shall not be done without permission, and then only carefully done under the direction of the Architect.
- B. All new work cut or damaged shall be patched and restored to its original condition.

2.4 EQUIPMENT ACCESS

- A. General: All valves, volume dampers, equipment and accessories shall be installed to permit access to equipment for maintenance, servicing or repairs. Any relocation of piping ductwork, equipment or accessories required to provide maintenance access shall be accomplished by the HVAC Contractor at no additional cost to the Owner.
- B. Provide access doors where equipment is located in chases or generally inaccessible. Access doors used in fire-rated construction must have UL label. Minimum access panel size 12" x 12" or of sufficient size to allow total access for maintenance. Coordinate location with General Contractor.
- C. Access panels shall be furnished and installed by the HVAC Contractor in plaster walls, ceilings and related inaccessible surfaces.
- D. Access Doors: Milcor or approved equal, steel frames and door, prime coated, except stainless steel in areas subject to excessive moistures, such as toilet rooms.

2.5 EQUIPMENT SUPPORTS

- A. General: Provide all supporting steel and related materials not indicated on structural drawings as required for the installation of equipment and materials, including angles, channels, beams and hangers.

2.6 EQUIPMENT GUARDS

- A. General: Provide equipment guards over belt-driven assemblies, pump shafts, exposed fans and elsewhere, as indicated in this specification or required by code.

2.7 CONCRETE FOR HVAC WORK

- A. General: All concrete work necessary for HVAC equipment by the HVAC Contractor.
- B. General Standards: Except as otherwise indicated, comply with applicable provisions of Division 3 for concrete work.
- C. Concrete Equipment Pads: For each piece of HVAC equipment as indicated on the drawings, arrange to install a 4" concrete housekeeping pad a minimum of 2 inches wider than full size of the respective equipment's base. Equipment pads are required for the following equipment.
 - 1. None anticipated for this project.

2.8 PAINTING HVAC WORK

- A. General: All painting of mechanical equipment will be done by the HVAC Contractor unless equipment is hereinafter specified to be furnished with factory applied finish coats. Coordinate the exterior finish painting and color of exterior HVAC equipment with the General Contractor.
 - 1. Exposed ductwork in finished areas outside mechanical rooms shall be cleaned for accepting a paint finish or have factory-applied paint grip finish.
- B. Prime paint all field fabricated metal work under HVAC work, comply with applicable provisions of Division 9.
- C. All equipment shall be provided with factory applied prime finish, unless otherwise specified.
- D. Interior duct surfaces, dampers and other accessories visible through grilles, registers and diffusers shall be painted with flat black paint.
- E. If factory finish on any equipment is damaged in shipment or during construction of the building, the equipment shall be refinished by the Contractor to the satisfaction of the Architect.

2.9 HVAC SYSTEM IDENTIFICATION

- A. General: Provide adequate marking of HVAC system and control equipment to allow identification and coordination of maintenance activities and maintenance manuals. Tag and label HVAC equipment located in exposed or in accessible areas to conform to ANSI A13.1-1981. After painting and/or covering is complete, identify all equipment, piping and ductwork by its abbreviated generic name as shown/scheduled/specified.
- B. Equipment: Identify all major HVAC equipment with plastic-laminate signs or 2" minimum high painted stencils and contrasting background. Provide text of sufficient clarity and lettering to convey adequate information at each location and mount permanently. Identify control equipment by 1-1/2" x 4" plastic nameplates with 1/2" high lettering.
- C. Piping and Ductwork: Identify piping and ductwork once every 30 feet at each branch, at termination of lines, and near valve or equipment connections. Place flow directional arrows at each pipe or duct identification. Provide 2" minimum high letters on wrap-around siphonage, adhesive-backed or paint stenciled.
- D. Valves: Identify all valves with 1-1/2" minimum polished brass stamp-engraved or plastic laminate tags. Prefix or color-code tags for each generic piping service. Prepare and submit valve tag schedule, listing location, service and tag description, incorporate in Instruction Manual. Mount valve tag schedule behind glass in mechanical room at location determined by Owner.
- E. Operational Tags: Where needed for proper or adequate information on operation and maintenance of HVAC systems, provide tags of plasticized or laminated card stock, typewritten to convey the message.

PART 3 - EXECUTION

3.1 HVAC WORK CLOSEOUT

- A. Lubrication: Upon completion of the work and before turning over to the Owner clean and lubricate all bearings except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

- B. Contractor is responsible for maintaining lubrication of all mechanical equipment under his contract until work is accepted by the Owner.
- C. Cleaning: After installation has been completed, Contractor shall clean all systems. All piping and ductwork shall be cleaned both internally and externally to remove all dirt, plaster dust or other foreign materials. All temporary throwaway or replaceable media air filters used during the construction period shall be replaced by new filters or new filter media after construction has been completed and before the building is turned over to the Owner. Check all strainers for clean screens.
- D. All dirt, plaster dust and other foreign matter shall be blown and/or vacuum cleaned from coils, terminal devices, diffusers, registers and grilles. Equipment shall be thoroughly cleaned of all stains, paint spots, dirt and dust.
- E. Housecleaning and Cleanup: Periodically as work progresses and/or as directed by the Architect, the Contractor shall remove waste materials from the building and leave his area of work broom clean. Upon completion of work, remove all tools, scaffolding, broken and waste materials, etc., from the site.

3.2 INSTRUCTION AND MAINTENANCE MANUALS

- A. Instruction Manuals: Upon completion of work, but before final acceptance of the system, furnish to the Engineer for approval, three (3) instruction and maintenance manuals in loose leaf binders. One approved copy shall be returned for use during instructional period. Manual shall have an index of contents and tab for each piece of equipment or system, as well as the following:
 - 1. Manufacturer's O&M instructions, parts list and data sheets.
 - 2. Copies of all shop drawings.
 - 3. Wiring diagrams.
 - 4. Start-up and shutdown procedures.
 - 5. Composite electrical diagrams, and flow diagrams.
 - 6. Test records.
- C. Equipment Parts Lists: Include a complete list of all equipment furnished for project, with a tabulation of descriptive data of all the equipment replacement parts proposed for each type of equipment or system. Properly identify each part of part number and manufacturer.
- D. Instruct Owner's maintenance personnel in the operation and maintenance of all equipment, including composite operating cycle of all equipment. Include not less than 8 hours of instruction, using the O&M manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment.
- E. Service Organizations: At time of substantial completion, Contractor shall provide Owner with listing of qualified service organizations, including addresses and telephone numbers for each piece of major equipment.

3.3 RECORD DRAWINGS

- A. Refer to Division 1 for further requirements.
- B. Maintain a record set of as-built drawings for all HVAC work performed. As-built drawings shall be continuously updated as the project progresses and be available for periodic inspection by the A/E.

3.4 GUARANTEE PERIOD

- A. Guarantee all equipment, materials, and workmanship to be free from defects for one year after acceptance by the Owner. Repair, replace or alter systems found defective at no extra cost to the Owner.
- B. At the time of substantial completion, turn over the prime responsibility for operation of HVAC equipment and systems to the Owner's operating personnel. During guarantee period, provide one operating engineer, familiar with the work, to consult with and continue training Owner's personnel on an as-need basis.

END OF SECTION

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SECTION 23 05 90 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. General Requirements: Contractor shall be responsible for providing complete test-adjust-balance (TAB) work of all hydronic and air systems including distribution systems and the equipment and apparatus connected.
- B. Work Included:
1. The extent of TAB work is indicated by the requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, hydronic and air distribution systems, and associated equipment and apparatus of HVAC work.
 2. The work consists of setting speed and volume (flow) adjusting facilities provided for the systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the work as required by the Contract Documents.
 3. The component types of testing, adjusting and balancing specified in this section include but are not limited to the following HVAC equipment:
 - a. Air handling units and fan units.
 - b. Hydronic distribution.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
- | | | |
|----|----------|---------------------------------|
| 1. | 23 06 00 | Piping Specialties |
| 2. | 23 74 00 | Terminal Air Distribution Units |
| 3. | 23 90 00 | Controls and Instrumentation |
| 4. | 23 96 00 | Starting of Mechanical Systems |

1.3 QUALITY ASSURANCE

- A. Tester: Performed by an Independent Trade who is specifically and actively engaged in the balancing business and regularly does such work. Certified by the NEBB (National Environmental Balancing Bureau), AABC (Associated Air Balance Council) or approved equal in those testing and balanced disciplines similar to those required for this project.
- B. Reference Standards: Comply with AABC's Pub. No. 12173, "National Standards for Field Measurements and Instrumentation, Total System Balance", as applicable to HVAC air and hydronic distribution system and associated equipment and apparatus.
- C. Industry Standards: Comply with ASHRAE recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.
- D. Submittals:
1. Submit six (6) certified test report and types of instruments used and their most recent calibration data with submission of final test report.
 2. Final test report shall bear the name of the person who recorded the data and the seal of the supervisor of the balancing trade.
- E. Guarantee: Guarantee that all TAB work be performed in accordance with NEBB or AABC standards and that all air systems operate within plus or minus 10 percent of the design flow rates as shown on the plans and/or as scheduled.

1.4 JOB CONDITIONS

- A. Do not proceed with testing, adjusting and balancing work until the work to be TAB'ed has been completed and is operable. Ensure that there is no latent residual work still to be completed.
 - 1. Do not proceed until the work scheduled for TAB'ing is clean and free from debris, dirt and discarded building materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Patching Materials:
 - 1. Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housing which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.
 - 2. At Tester's option, plastic plugs with retainers may be used to patch drilled holes in ductwork and housing.
- B. Test Instruments: Utilize test instruments and equipment for the TAB work required, of the type, precision and capacity as recommended for the following TAB standards: AABC's National Standards for Field Measurements and Instrumentation, Total Balance System.

PART 3 - EXECUTION

3.1 ADJUSTMENT AND TESTING

- A. Tester must examine the installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Notify the Contractor in writing of conditions detrimental to the proper completion of the test-adjust-balance work. Do not proceed with the TAB work until unsatisfactory conditions have been corrected in a manner acceptable to the Tester.
- B. Test, adjust and balance the environmental systems and components, as indicated, in accordance with the procedures outlined in the applicable standards.
- C. Prepare report of the test results including instrumentation calibration reports in format recommended by the applicable standards.
- D. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in a manner recommended by the original Installer.
- E. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

3.2 AIR SYSTEMS

- A. Test, adjust and balance systems in accordance with the following procedure:
 - 1. Preliminary:
 - a. Identify and list size, type and manufacturer of all equipment to be tested, including air terminals; check all system components for proper installation and operation.
 - b. Use manufacturer's ratings for all equipment to make required calculations except where field test shows ratings to be impractical.
 - c. Verify that all instruments are accurately calibrated and maintained.
 - d. Install clean filters furnished by the mechanical contractor in all equipment.

2. Central System:
 - a. Test, adjust and record supply fan RPM design requirements within limits of mechanical equipment provided.
 - b. Test and record motor voltage and running amperes including motor nameplate data and starter heater ratings.
 - c. Make Pitot tube traverse of main supply, return and fresh air return ducts, determine and record CFM at fan and adjust fan to design CFM.
 - d. Test and record total system static pressure and suction and discharge static pressure across coils, filters and related air handling sections.
 - e. Test and adjust systems for design recirculated air; CFM.
 - f. Test and record cooling apparatus entering air temperatures; dry bulb and wet bulb.
 - g. Test and record heating apparatus entering and leaving air temperatures; dry bulb.
3. Each Fan:
 - a. Each outlet and inlet average velocity, area, CFM.
 - b. Test and record total system static pressure at suction and discharge of fan coils.
 - c. Fan RPM motor RPM.
 - d. Motor name plate current testing.
 - e. Motor current draw.
4. Distribution: Adjust zones or branch ducts to proper design CFM, supply; return and exhaust.
5. Air Terminals:
 - a. Identify each air terminal from reports as to location and determine required flow reading.
 - b. Test, adjust and balance each air terminal to within 10% of design requirement. Record readings.
 - c. Set minimum and maximum flow rates for VAV terminals at specified supply duct pressures and 90% system diversity(10% terminal units at minimum flow rate).
6. Verification:
 - a. Prepare summation of reading of observed CFM for each system, compare with required CFM and verify that values are within 10% of specified quantities. Determine final coil and filter static pressure drops.
 - b. Verify design CFM at fans as described above.

3.3 HYDRONIC SYSTEMS

A. Test, adjust and balance system in accordance with following procedures:

1. Preliminary:
 - a. List all mechanical specifications of tested equipment verify against contract documents. Check all system components for proper installation and operations. Clean all screens.
 - b. Open all line valves to full open position. Close coil bypass stop valves, then set mixing control valve to full coil flow.
 - c. For each pump, verify rotation, test and record pump shut-off head and test and record pump wide-open head.
 - d. Verify proper water level in expansion tanks and in the system.
 - e. Verify that air vents in high points of water systems are installed and operating freely.
 - f. Verify that all instruments are accurately calibrated and maintained.
2. Central Equipment:
 - a. Set and record hot water pumps to proper flow quantity.
 - b. Adjust and record flow of hot and chilled water through boilers and chiller equipment to design quantities.
 - c. Observe and record leaving water temperature and return water temperatures at boiler, chiller equipment and zone water distribution loops. Reset to correct design temperatures.
 - d. Record pump operating suction and discharge pressures. Determine final dynamic head.
3. Distribution:
 - a. Balance and record flow to each hot and chilled water hydronic zone and terminal unit. For heating mode and cooling mode (chiller).

- b. Adjust and record terminal unit flow rates and pressure drops.
- c. Adjust and record coil flow rates and pressure drops. Verify entering and leaving water temperatures at coil terminals.

3.4 AUTOMATIC CONTROL SYSTEM

- A. Temperature control manufacturer's representative sets and adjusts automatically operated devices to achieve required sequence of operations.
- B. Testing organization verifies all controls for proper calibration and list those controls requiring adjustment by temperature control system installer.

END OF SECTION

SECTION 23 06 00 - PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of pipe and pipe fitting work is indicated on drawings and by the requirements of this section.
- B. Types of pipe and pipe fittings required for this project include the following:
 - 1. Heating hot water
 - 2. Low Pressure Steam
 - 3. Low Pressure Steam Condensate

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 23 05 00 HVAC General Provisions
 - 2. 23 06 30 Piping Specialties
 - 3. 23 09 10 Supports and Anchors
 - 4. 23 10 00 Valves
 - 5. 23 63 00 Water Treatment

1.3 QUALITY ASSURANCE

- A. American National Standards Institute, ANSI:
 - 1. B31.1: Power Piping.
- B. Welder Qualifications:
 - 1. Prior to starting any metallic welding, Contractor shall submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau.
- C. Employ piping materials meeting the latest revision of ASTM specifications as listed in this specification.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Where possible, store pipe and tube inside and protected from weather. When necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.
- B. Prevent dirt and construction debris from accumulating inside the pipe and pipe fittings, cap open ends whenever possible. Store plastic pipe out of direct exposure to sunlight and support to prevent sagging and bending.

1.5 SUBMITTALS

- A. Submit schedule of pipe and pipe fittings showing manufacturer and catalog number.
- B. Submittal may be in the form of a typewritten list, with proper references, indicating service and pipe or pipe fitting specifications.

PART 2 - PRODUCTS

2.1 HOT WATER SYSTEM

A. 2" and smaller:

1. ASTM A-53 Type F, standard weight, schedule 40, black steel pipe with class 125, standard weight cast iron threaded fittings.
2. ASTM B88 seamless, Type L, hard temper copper tube with wrought copper 95-5 solder-joint fittings.
3. Mechanical compression type fittings with integral o-ring seal, Viega ProPress or approved equal.
4. Rated PEXa piping may provided from copper manifolds to terminal unit reheat coils.

2.2. LOW PRESSURE STEAM (15 psig and lower)

- #### **A. 2" and Smaller above grade in buildings: ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.**

2.3 LOW PRESSURE STEAM CONDENSATE (Steam pressure 15 psig and lower)

- #### **B. 2" and Smaller above grade in buildings: ASTM A53, type F, extra strong (schedule 80) black steel pipe with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.**

2.3 DIELECTRIC UNIONS

- #### **A. 1" and smaller: ASTM A197/ANSI B16.3 WOG malleable insulating unions with vulcanized fiber insulating sleeve and neoprene gasket, equal to Stockam Figure 693-1/2, or EPCO model FX or FB dielectric unions with Epconite No. 2 gasket, 250 PSIG at 210 degrees F.**
- #### **B. 1-1/2" and larger: EPCO model GX dielectric flange with Epconite No. 2 gasket, 175 PSIG at 210 degrees F.**
- #### **C. Clear flow dielectric fittings may be used in lieu of dielectric unions for pipe sizes 2" and smaller.**

2.4 UNIONS AND FLANGES

A. 2" and smaller:

1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Copper unions with all copper piping. Stainless steel unions with all stainless steel pipings.
2. Use unions of a pressure class equal to or higher than specified for the fittings of the respective piping service.

PART 3 - EXECUTION

3.1 PREPARATION

- #### **A. Set pipe on end and hammer sides to remove foreign materials before erection. Ream ends of all piping to remove burrs.**

3.2 ERECTION

- #### **A. Install all piping parallel to building walls and ceilings and at such heights not to obstruct any portion of window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact**

location of pipe spaces, ceiling heights, door and window openings or other architectural details before installing piping.

- B. Provide anchors, expansion joints, swing joints and expansion loops so that piping may expand and contract without damage to itself, equipment or building.
- C. Mitered ells, notches tees and "orange peel" reducers are not acceptable. On threaded piping, bushings are not acceptable.
- D. "Weld-o-lets" and "Thread-o-lets" may be used for branch takeoff up to one half (1/2) the diameter of the main.
- E. Install drains throughout the systems to permit complete drainage of the entire system.
- F. Do not install piping through dedicated electrical rooms or spaces unless the piping is serving this room or space.
- G. Install 2" deep galvanized sheet metal drain pans below piping which passes over electrical switching apparatus. Pipe drain pans to an accessible location with a drain valve and hose bibb adapter such that the system may be drained without damage to other equipment, insulation or finished spaces.
- H. Install all valves, control valves and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section.

3.3 INSTALLATION OF PIPE

- A. Run pipe lines straight and true, parallel to building lines with minimum use of offsets and couplings.
- B. Provide only such offsets as may be required to provide necessary head room or clearance and to provide necessary flexibility in pipe lines.
- C. Changes:
 - 1. Changes in direction of pipe lines made only with fittings or pipe bends.
 - 2. Changes in size shall be made only with fittings.
 - 3. Do not use miter fittings, face of flush bushings or street elbows.
 - 4. All fittings of long radius type, unless otherwise indicated.
- D. Use full and double lengths wherever possible:
 - 1. Cut pipe to exact measurement and install without springing or forcing except in case of expansion loops where cold springing is indicated.
 - 2. Take particular care to avoid creating, even temporarily, undue loads, forces, or strains on valves, equipment or building elements either piping connections or piping supports.
- E. Install piping to allow for expansion and contraction without stressing pipe or equipment connected.
- F. Provide clearance for installation of insulation and for access to valves, air vents, drains, and unions.
- G. Sizing:
 - 1. Unless otherwise indicated, install all supply piping, including shut-off valves and strainers, to coils, pumps, and other equipment at line size with reduction in size being made only at inlet to control valve or pump.
 - 2. Install supply piping from outlet of control valve at full size connection in equipment served.
 - 3. Install outlet piping including dirt pockets or mud legs from equipment full size of connection in equipment served.

4. Install piping, check valves, strainers, and shut-off valves in these equipment outlet or return lines beyond dirt pockets size of tapping in trap or if no trap, size of equipment connection.
- H. Make reductions in water pipes with eccentric reducing fittings installed to provide drainage and venting.
- I. Branch Take-Offs:
1. Liquids: From top, bottom, or side of mains or headers at either 45 degrees or 90 degrees from horizontal plane.
 2. Use main sized saddle type branch connections or directly connecting branch lines to mains in steel piping if main is at least 1 pipe size larger than branch for up to 6 inch mains.
 3. Do not project branch pipes inside main pipe.
 4. Provide flanges or unions at all final connections to equipment, traps and valves to facilitate dismantling.
 5. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- J. Pipe Drainage Provision:
1. Slope water piping 1 inch in 40 feet and arrange to drain at low points.
 2. Closed Systems:
 - a. Equip low points with 3/4 inch valves and hose nipples.
 - b. At high points, provide collecting chambers and high capacity float-operated automatic air vents or manual air vents.

3.4 THREADED PIPE JOINTS

- A. Cut threads so that no more than three threads remain exposed after the joint is made. Ream all pipe ends after cutting and clean before erection. Use a thread lubricant when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.5 COPPER PIPE JOINTS

- A. Remove all slivers and burrs remaining from the tube cut by reaming and filing both pipe surfaces. Clean fitting and tube with emery or sand cloth. Remove residue from the cleaning operation, apply flux and assemble joint. Use solder or brazing to secure joint as specified for the specific piping service.

3.6 WATER SYSTEMS

- A. Pitch horizontal mains up at 1 inch in 40 feet in the direction of flow. Install manual air vents at all high points where air may collect. If vent is not in an accessible location, extend air vent piping to the nearest code acceptable drain location with vent valve located at the drain.
- B. Main branches and runouts to terminal equipment may be made at the top, side or bottom of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located as described above.
- C. Use top connection to main for upfeed risers and bottom connection to main for downfeed risers. Connections at a main may be made with a tee and a 45 degree elbow.
- D. Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping system. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.
- E. Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

- F. When other specification sections or piping details do not require a strainer upstream of each control valve, install bottom connections to a main with a capped dirt leg.
- G. Where copper piping is allowed for heating hot water or solar hot water systems, secure all joints and fittings with 95-5 tin-antimony solder or brazing alloys.
- H. Where mechanically formed tee fittings are allowed, form mechanically extracted collars in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. The collaring device shall be adjustable.
- I. Notch and dimple the branch tube. Braze the joint. Apply heat properly so that pipe and tee does not distort. Remove distorted connections.

3.7 STEAM AND STEAM CONDENSATE

- A. Pitch mains down 1 inch in 40 feet in the direction of flow. Pitch terminal equipment runouts down 1 inch in 2 feet for proper condensate drainage.
- B. Install drip traps at each rise, at the horizontal termination of each steam main and as needed to prevent water hammer but at a maximum spacing of 250 ft..
- C. Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper condensate drainage. Concentric fittings may be used for changes in vertical pipe sizes.
- D. Make branch connections and runouts at the top of the main or 45 degrees from the top. Condensate connections may be made in the horizontal plane in limited space situations.
- E. Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping system. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.
- F. Install flanges, taps, vents and drains needed to fill, vent and drain the piping for hydrostatic testing.

3.8 VENTS AND RELIEF VENTS

- A. Install vent line and relief valve discharge lines as indicated on the drawings, as detailed, and as specified for each specific valve or piping specialty item.

3.9 COOLING COIL CONDENSATE

- A. Trap each cooling coil drain pan connection with a trap seal of sufficient depth to prevent conditioned air from moving through the piping. Extend drain piping to nearest code approved drain locations. Construct trap with plugged tees for cleanout purposes as detailed

3.10 DIELECTRIC UNIONS

- A. Install insulating or dielectric unions or flanges at each point where a copper to steel pipe connection is required in the following systems.
 1. Cold water or non-potable make-up water lines.
 2. Hot water system.
 3. Dielectric unions shall not be used at terminal heating/cooling devices.

3.11 UNIONS AND FLANGES

- A. Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve.

1. Concealed unions or flanges are not acceptable.

3.12 PIPE SYSTEM LEAK TESTS

- A. Conduct pressure test with test medium of air or water unless specifically indicated. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.
- B. No systems to be insulated until it has been successfully tested. If required for the additional pressure load under test, provide temporary restraints at expansion joints or isolate them during the test. Minimum test time shall be as scheduled below plus such additional time as may be necessary to conduct the examination for leakage.
- C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges. Measure and record test pressure at the high point in the system.
- D. For air tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. The piping system exclusive of possible localized instances at pump or valve packing shall show no evidence of leaking.

E.

<u>System</u>	<u>Test Pressure</u>	<u>Medium</u>	<u>Duration</u>
Heat Water	100 PSIG	Water	8 hours

3.13 PIPE CLEANING

- A. Flush all water and condensate systems clear of all dirt and foreign matter with all pumps bypassed and all strainers removed from strainer bodies. Provide circulation by means of Trade Supplied portable pumping apparatus.
- B. After initial flushing of a system, use portable pumping apparatus for a continuous 24 hour circulation of a cold water detergent equal to Nalco 2567 cleaner. Flush detergent clear with continuous draining and raw water fill for an additional 12 hours or until all cleaner is removed from the system. Replace strainers and reconnect permanent pumping apparatus.

3.14 INITIAL SYSTEM FILL AND VENT

- A. Fill and vent all systems with proper working fluids.
- B. Fluids to be chemically treated as specified in Water Treatment Section 15639B.

END OF SECTION

SECTION 23 09 10 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Pipe hangers and supports for mechanical system piping.

1.2 RELATED DOCUMENTS

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

- B. Specified Elsewhere:

- | | | |
|----|----------|-----------------------|
| 1. | 23 06 30 | Piping Specialties |
| 2. | 23 20 00 | Vibration Isolation |
| 3. | 23 25 00 | Mechanical Insulation |

1.3 QUALITY ASSURANCE

- A. Standards:

- | | |
|----|---------------------------------|
| 1. | <u>ANSI B31.1:</u> Power Piping |
| 2. | MSS SP58 & SP69 |

1.4 SUBMITTALS

- A. Submit shop drawings for the following:

1. Schedule of all manufactured hanger and support devices, indicating type of device for each pipe size range and type of service, including shielding devices as specified.

1.5 MANUFACTURERS

- A. Grinnell, Fee and Mason, Michigan Hanger, B-Line or Elcen, or approved equal.
- B. Grinnell figures listed as reference only.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless otherwise specified.
- B. Design supports of strength and rigidity to suit loading, service, and in manner, which will not unduly stress the building construction. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing whenever practical. Do not use perforated iron, chain or wire as hangers.
- C. Where piping can be conveniently grouped to allow the use of trapeze type supports, the supporting steel shall be by means of standard structural shapes or continuous insert channels. Where continuous insert channels are used, pipe-supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for approval.

2.2 EQUIPMENT SUPPORTS

- A. Provide all supporting steel, not indicated on the structural drawings, that is required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.
- B. Refer to HVAC Drawing details for further requirements.

2.3 PIPE HANGERS AND SUPPORTS

- A. Manufacturers: Grinnell, Fee and Mason, Michigan Hanger, B-Line or Elcen similar to the Grinnell figures listed.
- B. Pipe Hangers Application:
 - 1. 2" and smaller: Adjustable, swivel split ring type Grinnell Fig. 104 or lightweight, adjustable clevis type Grinnell Fig. 65.
 - 2. 2-1/2" and larger: Adjustable clevis type Grinnell Fig 260.
- C. Hangers for copper pipe without insulation shall be either copper plated or PVC coated.
- D. Hot piping 2" and smaller: Hanger may be secured directly to the pipe with insulation system around hanger.

2.4 INSULATION PROTECTION SHIELDS

- A. Application: Insulation protection shields are required on the following piping systems:
 - 1. Cold piping (under 60 deg. F): All sizes.
 - 2. Hot piping (over 120 deg. F): 2-1/2" and larger piping.
- B. Insulation Protection Shields: Grinnell Fig. 167, Fee & Mason or Elcen or other approved product, constructed of galvanized carbon steel. Select shield to accommodate outer diameter of insulation. Shield lengths and gauge shall be as follows:

<u>Pipe Size</u>	<u>Length</u>	<u>Gauge</u>
1/2" thru 2-1/2"	12"	18
3" thru 6"	18"	16
8" thru 12"	24"	14

2.5 HANGER SUPPORT INSULATION

- A. Application: Piping 2-1/2" diameter and larger in conjunction with insulation protection shields to resist compression of insulation system.
- B. Hanger insulation system shall cover bottom half of pipe at the same thickness as pipe insulation system.

2.6 PIPE HANGER RODS

- A. Support rods shall conform to the latest MSS standards except as modified herein.
- B. Size rods for individual hangers and trapeze support as indicated in the following schedule:

<u>Pipe size</u>	<u>Maximum Rod Diameter</u>	<u>Load (lbs.)</u>
Up to 2"	3/8"	610
2-1/2" and 3"	1/2"	1130
4" and 5"	5/8"	1810
6"	3/4"	2710
8" thru 12"	7/8"	3770

- C. Furnish rods complete with adjusting and lock nuts.

- D. In piping 4 inches and larger, each valve shall be supported.

2.7 HANGERS AND SUPPORT SPACING

- A. Space pipe hangers and supports in accordance with the following schedule, with exceptions as indicated herein:

<u>Pipe size</u>	<u>Steel</u>	<u>Copper</u>
Up thru 1-1/4"	8'-0"	6'-0"
1-1/2" and 2"	10'-0"	8'-0"
2-1/2" and 3"	12'-0"	10'-0"
4" and 5"	14'-0"	10'-0"
6" to 12"	14'-0"	10'-0"

- B. Place hangers to meet the requirements of the piping section of this specification, with regard to pitch for drainage and venting, and clearance between services.
- C. Place hangers within one foot of each elbow and at each valve and strainer for piping 4" and above.

2.8 BEAM CLAMPS

- A. Grinnell Fig. 87 Series beam clamps with retaining clip for hanger rods to 5/8". Maximum load 440 lbs.
- B. Grinnell Fig. 228 beam clamps with links for hanger rods 3/4" and above.

2.9 RISER CLAMPS

- A. Grinnell Fig. 261 for steel pipe, CT-121 for copper tubing.

2.10 CONCRETE INSERTS

- A. Grinnell Fig. 285, 281 or 282, poured concrete ceiling insert, suitable for rod diameter and weight supported.
- B. Inserts drilled and placed after concrete pour shall have steel shell with expander plug, not depending on soft lead for holding power.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install supports to provide for free expansion of the pipe. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.
- B. Coordinate hanger and support installation to properly group piping of all trades.

3.2 INSULATION PROTECTION SHIELDS

- A. Install insulation protection shields at support points for insulated piping as scheduled herein.
- B. Spacing shall be 10'-0" maximum based on insulation with a compressive strength of 15 psi. For insulation with compressive strengths greater than 15 psi, span may be increased proportionally up to a maximum allowable as listed under hanger and support spacing in this section.

END OF SECTION

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SECTION 23 10 00 - VALVES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Valves for mechanical system piping.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

- | | | |
|----|----------|----------------------------------|
| 1. | 23 05 90 | Testing, Adjusting and Balancing |
| 2. | 23 06 00 | Pipe and Pipe Fittings |
| 3. | 23 06 30 | Piping Specialties |

1.3 SUBMITTALS

- A. Submit shop drawings for all valves including all data concerning dimensions, materials of construction and pressure/temperature ratings.
- B. Mark shop drawings clearly for each system and note with the correct cross reference number.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers: Powell, Crane, Nibco, Hammond, Stockham, Lunkenheimer, Milwaukee.

1. Valves shall be of same manufacturer, unless otherwise approved by A/E.

- B. Acceptable manufacturer and Fig. No. are listed under each valve type as the standard for equal quality from approved manufacturers.

- C. Manufacturer's name and pressure ratings clearly mounted on outside of valve body.

- D. All valve packing to be non-asbestos and flexitallic type.

2.2 WATER SYSTEMS VALVES

A. Globe Valves:

1. Valves 2-1/2" and smaller: Bronze body, screwed pattern, renewable composition disc, union or screw-over bonnet, malleable iron hand wheel, 300 psi W.O.G., Mueller Fig. 203-AP or Metraflex No. 700.

B. Check Valves:

1. 2-1/2" and smaller: Bronze body, screwed, regrinding type, horizontal swing, renewable seat and disc, 150 SWP - 200 WOG rated. Nibco Fig. T-413-Y.

C. Spring Loaded Check Valves:

1. Valves 2-1/2" and smaller: Bronze or iron body, bronze trim, stainless steel spring, screwed, 250 psi WOG, Nibco Fig. T-480Y, Mueller Fig. 203-AP or Metraflex No. 700.

D. Balancing Valves(non-calibrated):

1. Valves 2-1/2" and smaller: Use eccentric plug valves or ball valves with memory stops.

E. Balancing Valves(calibrated):

1. Valves 2-1/2" and smaller: Refer to Section 23 06 30, Piping Specialties, under Flow Sensors and Meters.

F. Ball Valves:

1. Valves 2-1/2" and smaller: Bronze body, screwed, brass or stainless steel ball, full or conventional port, Teflon seat rings, blowout-proof stem, two-piece construction, 600 psi WOG, Apollo No. 70 Series, Milwaukee BA 100/150, Nibco T/S 585-70.
2. Provide valve neck extensions with sufficient length to allow for insulation where insulation is specified.

G. Drain Valves:

1. Bronze, screwed, Buna-N seat discs, hose thread adapter, 125 psi WOG, Nibco Fig 74, or ball valve as specified above with hose thread adaptor.
2. Minimum drain valve size - 3/4" except where strainer blowdown valves are indicated, drain valve same as blowdown connection size.

H. Combination Shut-off, Check and Balancing Valves:

1. 2" and smaller: Provide check valve and balance valve in series at pump discharge.
3. Design valves to permit repacking under full line pressure.

- I. Shut-off and Check Valves: Provide spring-loaded check valve and shut-off (ball or butterfly) valve in series at pump discharge.

2.3 GAUGE VALVES

- A. Trerice Fig. 735, 1/4" brass needle valve, threaded ends, 300 WOG rated.

2.4 LOW PRESSURE STEAM/CONDENSATE (15 psig or less)

- A. GATE VALVES: 2" and smaller: Class 150, bronze body, bronze trim, threaded ends, solid wedge, rising stem, non-asbestos packing, union bonnet, malleable iron hand wheel.
- B. GLOBE VALVES: 2" and smaller: Class 150, bronze body, bronze trim, threaded ends, teflon disc, rising stem, non-asbestos packing, union bonnet, malleable iron hand wheel.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install valves as shown on plans, details and according to the valve manufacturer's installation recommendations. Install valves with stems upright or horizontal.
- B. Install all temperature control valves furnished under Section 15900B - Controls and Instrumentation.

3.2 SHUT-OFF VALVES

- A. Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for servicing.

3.3 THROTTLING VALVES

- A. Install globe or angle valves for throttling service and control device or PRV station bypass.
- B. Install gate valves for throttling in steam systems sizes 8 inches and larger.

3.4 BALL VALVES

- A. Ball valves shall be used for water system shut-off valves.

3.5 BALANCING VALVES

- A. Provide balancing valves for complete balancing of water systems. Furnish calibrated balance valves and flow meters as specified in Section 23 06 30, Piping Specialties, under Flow Meters.

3.6 DRAIN VALVES

- A. Provide drain valves where specified, detailed and at all low points of piping systems for complete drainage of the systems.

END OF SECTION

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SECTION 23 25 00 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of mechanical insulation required by this section is indicated on drawings, and by requirements of this section.
- B. Work shall include all labor, equipment, accessories, materials and services required to furnish and install all insulation, fittings and finishes for piping, ducts and related mechanical equipment in the Heating, Ventilating and Air Conditioning Systems.
- C. The following types of insulation are specified in this section:
 - 1. Pipe insulation.
 - 2. Duct insulation.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 23 09 10 Support and Anchors
 - 2. 23 84 00 Ductwork

1.3 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. Owens-Corning
 - 2. Schuller
 - 3. Certainteed
- B. All insulating products delivered to the construction site shall be labeled with the manufacturer's name and description of materials.
- C. All insulation installation methods shall be performed in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions, except as modified in this section of specifications.

1.4 DEFINITIONS

- A. Concealed Ductwork: Concealed areas, where indicated in this section, shall apply to shafts, furred spaces, space above finished ceilings, low tunnels and crawl spaces.
- B. Exposed Ductwork: Exposed ductwork, include mechanical rooms, walk-through tunnels, and similar installations subjecting ductwork insulation to physical damage and tearing.

1.5 SUBMITTALS

- A. Submit shop drawings for insulation systems, including a schedule for all insulating materials, including adhesives, fastening methods, fitting materials, installed thickness and intended use of each material.
- B. Submittal shall include catalog sheets indicating density, thermal characteristics, jacket, and installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All products including vapor barriers and adhesives shall conform to NFPA Section 90A. All products except pipe insulation shall possess a flame spread rating of not over 25, without evidence of continued progressive combustion, and a smoke developed rating no higher than 50.

2.2 PIPING INSULATION SCHEDULE

A. Insulation Thickness Pipe Size Schedule:

Type of System	Fluid Temp. Range Deg F	*Run-outs Up to 2"	1" and Less	1-1/4" -2"	2-1/2" -4"	5&6 inch	8"& Up
<u>Hot Water:</u>							
Low Temp.	141-200	0.5	1.0	1.0	--	--	--
<u>Steam:</u>							
Low Pressure	200-220	1.0	1.0	--	--	--	--

*Runouts are extensions to individual terminal units not exceeding 12 ft. in length.

B. Insulation thickness shown in schedule are based on products having a maximum "k" factor of 0.26 at a mean temperature of 75 degrees F. These thicknesses can be reduced for products having significantly lower "k" values and shall be increased for products having higher "k" values in order to produce equivalent or greater thermal resistance. ("R" value of products equals the thickness of the insulation divided by the "k" factor.)

C. Insulation Application Schedule:

Type of System	Fluid Temp. Range (deg. F)	Type of Insulation
<u>Hot Water:</u>		
Low Temp/HWS&R	141-200	Glass Fiber
<u>Steam:</u>		
Low Pressure	200-220	Glass Fiber

2.3 PIPE INSULATION

A. Rigid molded glass fiber pipe insulation with ASJ type factory applied jacketing with a density of 3-4 lbs./cubic feet and a "k" factor of 0.25 @ 75 degrees F. mean. (Flame Spread 25, smoke development 50 per ASTM E 84-75, -20 degrees to 500 degrees F. usage.)

1. Jacket shall be glass fiber reinforced foil kraft laminate, factory applied, with white finish. Permeance shall not exceed 0.02 perms. Beach puncture resistance shall be 50 units minimum.
2. Provide Aluminum or UV-resistant PVC jacket for all exposed exterior piping insulation.

B. Flexible elastomeric thermal insulation with a "k" factor of 0.26 at 75 degrees F mean density of 5.0 lbs./cu. ft. and a maximum water vapor transmission of 0.17 per inch. Seal joints with manufacturers standard sealant. (Armaflex AP-Flame Spread 25, smoke development 50 per ASTM E 84-75, -40 degrees to 220 degrees F usage.)

2.4 DUCTWORK INSULATION

- A. Material: Flexible Glass Fiber Wrap: Flexible glass fiber insulation shall have a minimum density of 0.75 PCF with thermal conductivity of not more than 0.31 at 75 degrees F mean temperature and suitable for 240 degrees F with FSK aluminum foil reinforced vapor barrier jacket. Material shall meet NFPA 90A and 90B.
1. Jacket shall be glass fiber reinforced foil kraft laminate factory applied with paintable white finish. Permeance shall not exceed 0.04 perms. Beach puncture resistance shall be 15 units minimum.

2.5 DUCTWORK INSULATION SCHEDULE

- A. Supply Air Ducts:
1. Type Insulation: 1-1/2" Flexible Wrap (Concealed).
 2. Exposed ducts in conditioned spaces do not require external insulation (i.e. gym, etc.)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Application of insulation materials to piping, equipment, tanks and ductwork shall be done in accordance with manufacturer's written recommendations. Where thickness of insulation is not specified, use applicable thickness recommended by manufacturer and required by applicable codes.
- B. All insulation shall be continuous through wall and ceiling openings and sleeves. All covered pipe and ductwork is to be located a sufficient distance from walls, other pipe, ductwork and other obstacles to permit the application of the full thickness of insulation specified. (If necessary, extra fittings and pipe are to be used.)

3.2 PIPING INSTALLATION

- A. All pipe installation shall be installed with joints butted firmly together. All valves and fittings shall be insulated with mitered sections of insulation equal in density and thickness to the adjoining insulation by one of the following methods:
1. Premolded PVC fittings installed in accordance with the manufacturer's instructions.
 2. Jackets on pipe insulation laps are to be vapor sealed using self-sealing lap, lap-seal tape gun or adhesive such as Armstrong 520. All insulation ends are to be tapered and sealed regardless of service.
- B. Provide removable insulation sections to permit easy access where inspection, service and/or repairs are required.
1. Insulation for valves, unions (cold only), strainers, flexible connections and expansion joints shall be removable for inspection and repair.
- C. On all cold piping insulated with vapor barrier covering, use protection shield to over bottom one-half of insulated pipe. Provide half-round, 12" long, hanger block at the bottom half of the pipe in place of the fiberglass pipe insulation. The hanger blocks shall be molded cork or calcium silicate pipe insulation of the same thickness as the adjoining fiberglass pipe insulation. The vapor barrier jacket shall be continuous through the hanger location.
1. Provide removable elastomeric insulation wraps over cold piping unions.

- D. Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Pipe hangers on cold lines (dual temperature piping) are to be sized large enough to be installed over the outer surface of the insulation.
- E. On hot piping 2" and smaller, the hanger shall be secured directly to the pipe and the pipe insulation shall surround the hanger. Provide pipe covering protection saddles and hanger blocks at hanger locations on hot piping 4" and larger.
- F. Insulation shall preferably be applied while surfaces are hot. Chilled water lines shall be at room temperatures when insulation is applied.
- G. Omit insulation for the following:
 - 1. Discharges piping from safety and relief valves to outlets.
 - 2. Piping unions on hot only (HWS&R) systems.
 - 3. Provide removable insulation jackets over unions and valves for hot/chilled water systems.
 - 4. Hot water piping inside convactor, wall fin radiation and cabinet heater enclosures.
- H. Seal all exposed end sections of pipe covering with a coat of vapor barrier mastic. Childers CP-30 or equal.
- I. No covering shall be applied until after piping is cleaned and tested, inspected and approved.

3.3 DUCTWORK INSULATION INSTALLATION

- A. Insulation shall be installed per manufacturer recommendations with mechanical fasteners. Seal all joints and fasteners with UL labeled vapor proof tape.
- B. Provide finished edges at all access doors and ends.

3.4 INSTALLATION OF EQUIPMENT INSULATION

- A. General: Install insulation products in accordance with manufacturer's written instructions and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation materials with smooth and even surfaces.
- C. Clean and dry ductwork surfaces prior to insulating, Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. Do not insulate over equipment nameplates or ASME stamps. Bevel and seal insulation at these locations.
- E. Do not insulate factory insulated equipment.

3.5 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction; period, to avoid damage and deterioration.

END OF SECTION

SECTION 23 63 00 - WATER TREATMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This section includes requirements for water treatment related to the following:
 - 1. Closed Loop Treatment System
 - 2. Pipe Cleaning and Inhibiting Treatment
- B. Specification of an item in this section shall not relieve the HVAC Contractor from providing all items, materials, operations, methods, labor, equipment and incidentals necessary for a complete and functional system.
- C. All services will be performed by a qualified, full-time representative of the water treatment company.
 - 1. Coordinate water treatment with Owner's current water treatment program for compatible chemicals and treatment methods.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 23 06 00 Pipe and Pipe Fittings

1.3 SUBMITTALS

- A. Submit product data, installation and operating instructions.

1.4 SUPERVISION AND INSPECTION

- A. Water treatment manufacturer or his qualified representative to provide supervision and final inspection upon completion of installation and adjustment, shall submit report in writing, certifying the correctness of the installation in compliance with the specifications and proper operation.

PART 2 - PRODUCTS

2.1 CLOSED LOOP TREATMENT SYSTEM

- A. Water treatment consists of initial chemical type treatment to clean piping and prevent rust and scale in final fill treated water.
 - 1. Sequestering agent to reduce deposits and adjust pH.
 - 2. Corrosion inhibitors.
 - 3. Conductivity enhances.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Heating Contractor will provide initial fill treatment to each closed-loop system. After this initial treatment, the Owner shall be responsible for all future service requirements.
- B. Furnish start-up chemical treatment chemicals, procedures and certification after installation is complete.
- C. After start-up treatment, the treatment company shall be responsible for all water treatment service requirements for one year, to include the following treatment services performed by qualified, full time representatives of the treatment company.
 - 1. Initial water analysis and recommendations.
 - 2. Initial equipment clean-up chemicals, procedures and certification after clean-up is complete.
 - 3. Assistance during start-up of the treatment program.
 - 4. Instructions of operating personnel on proper feeding and control techniques.
 - 5. Periodic service and consultation meetings.
 - 6. Any necessary record forms and log sheets.
 - 7. Any required laboratory and technical assistance.

3.2 PIPE CLEANING AND INHIBITING GUIDELINES

- A. Cleaning: Hydronic water piping system shall be cleaned by using a solution consisting of a blend of organic alkaline penetrants, emulsifiers, surfactants and corrosion inhibitors and containing propylene glycol, methyl ether, phosphonates, sodium-meta-silicate-hydrate and sodium hydroxide.
 - 1. The material shall not contain tri-sodium phosphate.
 - 2. The piping system shall be filled, vented and circulated employing the chemical cleaner solution for a period of at least 24 hours or more in accordance with the manufacturer's recommendations and job site chemical tests. Water filters shall be removed from the system for this cleaning. The concentration shall be brought to a level which raises the M Alkalinity to a value of 250 above that for the existing water used for the fill.
 - 3. Chemical tests shall be made to verify these levels and submitted to the A/E. The system should be circulated, drained and flushed to achieve the original M Alkalinity level.
- B. Inhibitor:
 - 1. The inhibitor shall be added to the system after it is acceptably cleaned and flushed and refilled. The inhibitor shall consist of a boron nitrite, benzol thiazol, benzotriazole, mercapto-benzo-thiazole, tolyltriazole silicates and color trace all producing a scale and corrosion inhibitor system. The inhibitor shall be chemically installed to a concentration of 700 to 1000 parts per million and the solution shall be tested to indicate that it falls within this range.
 - 2. Test results shall be submitted to the A/E.
 - 3. The strainer baskets may be remounted before the system is inhibited.
- C. Supervision:
 - 1. The chemical supplier shall supervise the addition, the testing of the flushing and draining of all chemical scale and inhibitor solutions for all systems. Three copies of the chemical water status shall be submitted to the A/E for final approval.
 - 2. Cleaning, inhibiting and testing of the piping systems shall be carried out in the presence of the owner's representative.

END OF SECTION

SECTION 23 74 00 - TERMINAL AIR DISTRIBUTION UNITS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of terminal air distribution unit equipment work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of terminal air distribution unit equipment required for project include the following:
 - 1. VAV Boxes with reheat.
 - 2. VAV Boxes without reheat.
- C. Refer to other Division 15 temperature control system sections for control work required in conjunction with air distribution equipment.

1.2 RELATED DOCUMENTS

- A. Applicable provision of Division 1 governs work under this section.
- B. Specified Elsewhere:
 - 1. 23 05 90 Testing, Adjusting and Balancing
 - 2. 23 06 30 Piping Specialties
 - 3. 23 25 00 Mechanical Insulation
 - 4. 23 90 00 Controls and Instrumentation

1.3 QUALITY ASSURANCE

- A. IBR Compliance: Provide terminal heating units bearing the IBR Hydronics Institute Certified Rating Seal.
- B. AMCA Compliance: Provide air distribution equipment bearing the Air Movement and Control Association, Inc. (AMCA) Certified Rating Seal.
- C. UL Compliance: Provide air distribution equipment electrical components which have been listed and labeled by Underwriter Laboratories (UL).

1.4 SUBMITTALS

- A. Submit shop drawings for all equipment including all data concerning dimensions, air flow capacities, sound ratings, unit pressure drop, finish and appropriate identification.
- B. Submit certified sound data for both casing discharge and radiated sound levels from 125 thru 8000 Hz as tested in accordance with Air Diffusion Council (ADC) Test Standard 1062R4.

PART 2 - PRODUCTS

2.1 VARIABLE AIR VOLUME BOXES

- A. General: Provide single-duct VAV boxes of size and arrangement as indicated on Drawings, and of capacities and having accessories as scheduled.
- B. Housing: Factory assembled unit with welded 26-gauge galvanized steel casing, acoustically and thermally lined with 1" thick 3 PSF fiberglass with high-density facing. Leakage rate 2% maximum at 0.5 inch W.G. Insulation to be UL listed and meet NFPA 90A requirements.

1. Provide bottom or side access panel for air valve.
 2. Provide bottom or side access panel upstream and downstream of reheat coil. Access panel shall be large enough to allow proper cleaning of reheat coil without dismantling ductwork.
- C. Air Valves: Air flow control device with integral actuator. Electronic volume regulator supplied by Temperature Control Contractor, factory or field installed. Integral flow ring sensor with taps and calibration chart to measure air flow with 10% regardless of inlet connections.
- D. V.A.V. Box Control: DDC/Electronic actuators, sensor wiring and application-specific controller supplied by Temperature Control Contractor, field-installed.
- F. Hot Water Coil: Performance and rated capacities as indicated on schedules on Drawings.
1. Hot water coil with aluminum fins mechanically bonded to 5/8" OD seamless copper tube. Same end connections.
 2. Coil leak tested at 300 PSIG air pressure, under water.
 3. Provide duct extensions for access panel installation upstream of reheat coil to clean coil surface.
- G. Acceptable Manufacturers:
1. Enviro-Tec
 2. Trane
 3. Carnes
 4. Titus

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which terminal air distribution units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF TERMINAL AIR DISTRIBUTION EQUIPMENT

- A. Install terminal air distribution equipment where indicated, in accordance with equipment manufacturers installation instructions, and with recognized industry practices to ensure that equipment complies with requirements and serves intended purposes.
1. Provided proper service clearance space for controls and damper actuators.
 2. Provide duct access panels upstream and downstream of reheat coils.
- B. Coordinate with other work, including ductwork, piping and control work as necessary to interface installation of terminal air distribution equipment with other work.

3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation of terminal unit equipment, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, and then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

END OF SECTION

SECTION 23 84 00 - DUCTWORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of ductwork requirements is indicated on the Drawings and by requirements of this section.
- B. The ductwork requirements for this project include the following:
 - 1. Low-Pressure Ductwork
 - 2. High-Pressure Ductwork
 - 3. Plenums
 - 4. Flexible Ductwork
 - 5. Acoustic Duct Lining

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 23 25 00 Mechanical Insulation
 - 2. 23 86 00 Ductwork Accessories

1.3 QUALITY ASSURANCE

- A. SMACNA Standards: Comply with SMACNA "HVAC Duct Construction Standards" first edition 1985 for fabrication and installation of metal and flexible ductwork.
- B. ASHRAE Standards: Comply with ASHRAE Handbook and Product Directory, 1979 Equipment Volume, Chapter 1 "Duct Construction", for fabrication and installation of ductwork.
- C. NFPA Compliance: Comply with ANSI/NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" and ANSI/NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
- D. ACIGH Industrial Ventilation 24th Edition 2001.

1.4 SUBMITTALS

- A. Submit product data and specifications for ductwork materials.
- B. Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for low and high-pressure and exhaust ductwork systems.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS

- A. Above ground, general ductwork: Galvanized steel, lock-forming quality, ASTM A527; 1.25 oz. zinc coating each side, mill phosphatized, ASTM A525.
 - 1. Round – Spiral wound ductwork.
- B. Steel Ducts: Galvanized steel, lock-forming quality, ASTM A527; 1.25 oz. zinc coating each side(G90), mill phosphatized, ASTM A525.

- C. Stainless Steel Ducts: ASTM A167, Type 304.
- D. Flexible Duct:
 - 1. Spiral wire Reinforced Fabric: Spiral wire reinforced fabric type flexible duct shall be made of a corrosion-resistant reinforcing wire helix bonded to a continuous layer of fabric. Class I Air Duct Material, UL Standard 181.
- E. Insulated Flexible Duct: Insulation shall be cellular glass, 1-1/2" nominal thickness of 1-1/2 pound density per cubic foot. The insulation shall encase the flexible duct and shall be sheathed with vapor barrier having a permeability of not over 2.0 perm. Insulation and vapor barrier shall be factory installed.
- F. Flexible Fiberglass Duct Liner: Flexible coated glass fiber duct liner; ANSI/ASTM C553; 'K' value of 0.26 at 75 degrees F; 1-1/2 lbs./cu. ft. minimum density; coated air side for maximum 4,000 ft./min. air velocity.
 - 1. Lagging Adhesives: Fire resistive to ASTM E84, NFPA 255.
 - 2. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad or mechanical fastener type as recommended, insulation manufacturer.
- G. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant gaskets and tapes as compounded and recommended by the manufacturer specifically for sealing joints and seams in ductwork.
- H. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
- I. Drive Screws and Clamps: As recommended by SMACNA.
- J. Factory Made Joints: Ductmate system as manufactured by Ductmate Industries, Inc., Nexus system as manufactured by Exanno, or other approved product may be used.

2.2 DUCTWORK PRESSURE-VELOCITY CLASSIFICATION

- A. General: Construct ductwork in conformance to SMACNA "HVAC Duct Construction Standards" 1st edition 1985.
- B. Low Pressure Ductwork:
 - 1. Static Pressure Class: +2" W.G.
 - 2. Maximum Velocity Level: 2500 FPM.
- C. High Pressure Ductwork:
 - 1. Static Pressure Class: +4" W.G.
 - 2. Maximum Velocity Level: 4000 FPM.

2.3 DUCTWORK SEALING CLASSIFICATION

- A. General: Construct ductwork in conformance to SMACNA "HVAC Duct Construction Standards" 1st edition 1985.
- B. Low Pressure Ductwork:
 - 1. Seal Class: B seal transverse joints and longitudinal seams.
- C. High Pressure Ductwork:
 - 1. Seal Class: A seal transverse joints and longitudinal seams and ductwall penetrations.

2.4 FABRICATION

- A. Shop fabricate ductwork in 4, 8, 10, or 12 foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembling and coordinated installation.
- B. All dimensions indicated on drawings are free area ductwork requirements. Increase ductwork dimensions to accommodate ductwork lining requirements.
- C. Accessories:
1. Fabricate ductwork with accessories such as air turns, extractors, and volume dampers, installed during fabrication to greatest extent possible.
 2. Fabricate ductwork with duct liner in each section of duct where required.
- D. Variation: No variation of duct configuration or sizes permitted except by written permission.
- E. Directional Change:
1. Construct tees, bends, and elbows with radius minimum 1-1/2 times width of duct on center lines.
 2. Where not possible and where rectangular elbows used, provide airfoil type turning vanes.
 3. Where acoustical lining is required, provide turning vanes of perforated metal type with fiberglass inside.
- F. Size Change:
1. Increase duct sizes gradually, not exceeding 15 deg. divergence wherever possible.
 2. Maximum divergence upstream of equipment to be 30 deg. and 45 deg. convergence downstream.
- G. Seams and Joints:
1. Seams and joints fabricated in accordance with SMACNA standards.
 2. Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so not to breathe, rattle, vibrate, or sag.

2.5 LOW PRESSURE DUCTWORK

- A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on center line. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
1. Where acoustic lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

- E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
- F. Connect flexible ducts to metal ducts with adhesive and draw bands.
- G. Round Duct Take-Offs: Provide conical or bellmouth low-pressure fittings.
- H. Square Duct Take-Offs: Provide 45 degree leading edge at square take-off with 4: minimum depth.

2.6 HIGH PRESSURE DUCTWORK

- A. Fabricate and support in accordance with SMACNA High Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide airfoil-turning vanes. Where acoustical lining is required, provide turning vanes of perforated metal with glass fiber insulation. Weld in place.
- C. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.
- D. Fabricate continuously welded medium and high pressure round and oval duct fittings as indicated in SMACNA Standard. Joints shall be minimum 4-inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Round or flat oval type ducts shall be constructed with lock tight spiral seams, gored elbows with centerline radius of 1-1/2 times the duct diameter and male/female fittings.
- F. Take-Offs: Conical tees, conical 45 degree laterals, conical bellmouth taps and fittings shall be used. Seal all joints airtight with gaskets and mastic sealants.
- G. Fabricated rectangular ducts shall be constructed with companion angle flanged joints secured to duct walls. Use continuous closed cell gasket at joints with snap-on cleats and corner bolts. Provide 45-degree close openings at takeoffs and corners. Seal all joints air tight with gaskets and mastic sealants.

2.7 DUCTWORK APPLICATION SCHEDULE

	<u>Air System</u>	<u>Classification</u>	<u>Material</u>
A.	Supply air - AHU's to VAV boxes:	High Press	Steel
B.	Return air - to AHU's:	Low Press	Steel
C.	Supply air - VAV boxes to outlets:	Low Press	Steel
D.	Exhaust air:	Low Press	Steel
E.	Transfer air:	Low Press	Steel

2.8 ACOUSTIC DUCT LINING APPLICATION SCHEDULE

	<u>Air System</u>	<u>Thickness</u>
A.	Transfer Ducts:	1"

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble and install ductwork in accordance with SMACNA standards, and which will achieve airtight and noiseless systems, capable of performing each indicated service.
 - 1. Align ductwork accurately at connections.

2. Support ducts rigidly with suitable ties, braces, hangers and anchors of type, which will hold ducts straight, plumb and free of sags and vibration.
- B. Electrical Equipment Spaces: Do not run ductwork through transformer vaults and other electrical equipment spaces and enclosures.
- C. Metal Duct Support:
1. Support ductwork from building structure as required and, where not otherwise indicated, anchor with bolts, concrete inserts, steel expansion anchors, welded studs, C-clamps or special beam clamps.
 2. Support vertical ducts, at 12 foot spacing, by attachment to adjacent vertical structural surfaces or by direct bearing at floor penetrations and similar locations.
 3. Support horizontal ducts located against structural walls and other similar adjacent vertical surfaces, at 8 foot spacing for ducts up to 40 inches horizontal dimension and 4 foot spacing for larger ducts.
 4. Hang horizontal rectangular ducts from overhead structure, at 10 feet spacing for duct widths up to 60 inches and 8 foot spacing for larger ducts.
 5. Arrange hangers, supports and duct rests to permit free, unrestrained and noiseless expansion and contraction of duct.
 6. Where duct lining not used, vertical members may be fastened to duct sides with sheet metal screws.
 7. Where duct lining is used, do not puncture sheet metal.
- D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Slope underground ducts to plenums or low pumpout points at 1:100 feet. Provide access doors for inspection.
- G. Connect terminal units to high-pressure ducts directly with three-foot maximum length of flexible duct. Do not use flexible duct to change direction.
- H. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout.
- I. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- J. Provide sleeved opening where ducts pass through smoke, fire and sound walls.
1. Seal space between duct and sleeve airtight with mineral wool or approved fire stopping material.
 2. Provide duct flange to cover and retain fire-stopping material.
- K. Connections:
1. Connect duct to equipment with flexible fabric, sheet metal clips, screws and washers.
 2. Connect branch take-offs to include prefabricated air scoops formed of same material as associated duct system.
 3. Connect diffusers or plenum boots to low-pressure ducts with 10-foot maximum length of flexible duct, held in place with strap or clamp.
- L. Flexible Ductwork:

1. Do not exceed 6 feet in length in accordance with NFPA 90.
2. Install flexible ductwork with minimum offsets and trim.
3. Connect with factory-installed compression coupling each end or provide separate adjustable bond and clamp to secure duct to trunk fitting and to distribution unit fitting.
4. Where recommended by manufacturer, make connections with mastic duct tape and adjustable clamp.

3.2 ADJUSTING AND CLEANING DUCTWORK

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment, which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- B. Clean duct systems with high power vacuum machines. Protect equipment, which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.3 DUCT LEAKAGE

- A. Inspect all ductwork for leak sources and repair.
- B. Do not insulate ductwork until it has been accepted for duct leakage.
- C. Refer to Section 23 05 90 for Testing, Adjusting, and Balancing requirements of ductwork system.
- D. Low pressure ductwork leakage rate shall not exceed 5%.
- E. High pressure ductwork leakage rate shall not exceed 2%.

END OF SECTION

SECTION 23 86 00 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of duct accessories work is indicated on drawings and in schedules, and by requirements of this section.
- B. Types of duct accessories required for this project include the following:
 - 1. Dampers:
 - a. Manual dampers
 - b. Control dampers
 - 2. Fire dampers
 - 3. Turning vanes
 - 4. Duct hardware
 - 5. Duct access panels
 - 6. Flexible connections
 - 7. Duct Silencers

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 23 25 00 Mechanical Insulation
 - 2. 23 84 00 Ductwork
 - 3. 23 90 00 Controls and Instrumentation

1.3 QUALITY ASSURANCE

- A. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association SMACNA "HVAC Duct Construction Standards" 1st edition, 1985.
- B. Industry Standards: Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers Inc. (ASHRAE) recommendations pertaining to construction of duct accessories, except as otherwise indicated.
- C. UL Compliance: Construct, test, and label fire dampers in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers".
- D. NFPA Compliance: Comply with applicable provisions of ANSI/NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of duct accessories.

PART 2 - PRODUCTS

2.1 DAMPERS

- A. Manual Dampers: Provide dampers of single blade type (up to 6" height) or multiblade type (over 6" height), constructed in accordance with SMACNA Standards. Provide damper operator with locking devices and damper position indicator.
- B. Automatic Control Dampers (ACD): Refer to Division 15900C section "Controls and Instrumentation" for automatic control damper requirements. Furnished by Temperature Controls Contractor.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dampers which may be incorporated in the work include, but are not limited to the following:

1. Honeywell.
2. Vent Products
3. Ruskin Mfg. Co.

2.2 FIRE DAMPERS

A. Fire Dampers: Provide 1-1/2 hour, Type 'B' UL listed fire dampers, of sizes indicated, unless indicated otherwise. Construct casing of 16 ga. galvanized steel with bonded red acrylic enamel finish. Provide fusible link as required. Provide damper with positive lock in closed position, and with the following additional features:

1. U.L. Listed Fire Rating: 1-1/2 hour
2. Damper Blade Assembly: Curtain type.
3. Blade Material: Steel, match casing.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire and smoke dampers which may be incorporated in the work include, but are not limited to the following:

1. Air Balance Inc.
2. Safe Air Inc.
3. Ruskin Mfg. Co.

2.3 TURNING VANES

A. Manufactured Turning Vanes: Provide turning vanes constructed of 1.5" wide curved blades set at 1.5" spacing O.C., supported with bars perpendicular to blade set at 2" O.C., and set into side strips suitable for mounting in ductwork. Double wall type turning vanes shall be 2" radius, 2-1/8" spacing O.C.

1. Ducts over 24-inch dimension shall use double-wall airfoil type turning vane.
2. Ducts with air velocity over 2500 FPM shall use double-wall airfoil type turning vane.

B. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

1. Provide where acoustic duct liner is required.

2.4 DUCT HARDWARE

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

1. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct hardware which may be incorporated in the work include, but are not limited to the following:

1. Ventfabrics, Inc.
2. Young Regulator Co.

2.5 DUCT ACCESS PANELS

- A. General: Provide where indicated, duct access panels of size indicated. Minimum size 12" x 12". Access panels are required at the following equipment, but are not limited to these locations:
1. Upstream and downstream of reheat or duct-mounted coils.
 2. Fire Dampers.
 3. Backdraft and motorized dampers.
 4. Automatic Control Dampers - internally mounted.
 5. Louvers.
- B. Construction: Construct of same or greater gauge as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one (1) handle-type latch for doors 1/2" high and smaller, 2 handle-type latched for larger doors.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct access door which may be incorporated in the work include, but are not limited to the following:
- 1 Air Balance Inc.
 - 2 Duro Dyne Corp.
 - 3 Ruskin Mfg. Co.
 - 4 Ventfabrics Inc.

2.6 FLEXIBLE CONNECTIONS

- A. General: Provide flexible duct connections, wherever ductwork connects to vibration-isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2.7 DUCT SILENCERS

- A. General Requirements: Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.
1. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.
 2. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.
 3. All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted in Section G below, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
 4. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.
 5. Fire-Performance Characteristics: Silencer assemblies, including acoustic media fill, Vibar™ film liner, sealants, and acoustical spacer, shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.
 6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.
- B. Rectangular Silencers including models RD: Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 22 gauge.

- C. Rectangular Elbow Silencers including models RED: Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 18 gauge. All acoustical splitters shall be internally radiused and aerodynamically designed for efficient turning of the air. Half and full splitters are required as necessary to achieve the scheduled insertion loss. All elbow silencers with a turning cross-section dimension greater than 48" shall have at least two half splitters and one full splitter.
- D. Inner perforated metal liner: ASTM A 653/A 653M, G90 galvanized sheet steel.
 - 1. Rectangular Silencers: 26 gauge.
 - 2. Rectangular Elbow Silencers: 22 gauge.
- E. Principal Sound-Absorbing Mechanism:
 - 1. Dissipative silencers: Models RD and RED type with acoustic media. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin.
 - 2. Glass fiber density and compression shall be as required to insure conformance with laboratory test data.
 - 3. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly.
 - 4. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.
- F. Media Protection:
 - 1. Dissipative silencers, including models RD and RED: Where indicated on the silencer schedule, media shall be encapsulated in glass fiber cloth to help prevent shedding, erosion and impregnation of the glass fiber.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which duct accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install duct accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA Standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90 deg. elbows in supply and exhaust air systems, and elsewhere as indicated.
- C. Install access doors to open against systems air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- D. Coordinate with other work, including ductwork as necessary to interface installation of duct accessories properly with other work.
 - 1. Install control dampers provided by Temperature Control Contractor.
- E. Field Quality Control: Operate installed duct accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak proof performance.

END OF SECTION

SECTION 23 87 00 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of outlets and inlets required for project include the following:
 - 1. Ceiling Diffusers
 - 2. Return & Exhaust Registers and Grilles

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 23 84 00 Ductwork
 - 2. 23 86 00 Ductwork Accessories

1.3 QUALITY CONTROL

- A. Manufacturers: Firms regularly engaged in manufacturer of outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. Acceptable manufacturers are listed as follows:
 - 1. Carnes
 - 2. Titus
 - 3. Metal-Aire
 - 4. Krueger
 - 5. Price.
- B. ARI Standards: Comply with Air Conditioning and Refrigeration Institute (ARI) Standard 650 "Air Outlets and Inlets".
- C. ADC Standards: Comply with Air Diffusion Council standards.
- D. MCA Standards: Comply with Air Moving and Conditioning Association standards.

1.4 SUBMITTALS

- A. Submit shop drawings covering each item together with schedule of outlets and inlets.
- B. Submit manufacturer's air diffusion performance data and installation instructions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Except as otherwise indicated, provide manufacturers standard outlet and inlet products where shown, of size, shape, capacity and type indicated on schedules, constructed of materials and components as indicated, and as required for complete installation.

- B. Performance: Provide outlet and inlet products that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturers current data and schedule for application.
- C. Ceiling Compatibility: Provide outlet and inlet products with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of ceiling air diffuser.

2.2 CEILING DIFFUSERS

- A. Ceiling Diffusers: Face panel and blades shall be constructed of galvanized steel with exposed surfaces finished in off-white or as scheduled. Diffuser shall have horizontal directional blades for airflow, round or square neck with opposed blade damper. Adjustable vertical or horizontal hinged blades, where scheduled.
 - 1. Extruded aluminum construction.
- B. Diffuser is designed to mount over T-bar suspended or surface mounted in plaster ceiling systems.

2.3 PERFORATED CEILING GRILLES

- A. Perforated Square: Steel construction, perforated hinged face, T-Bar mounted, white finish with black interior. Square or round neck, as scheduled.

2.4 RETURN AND EXHAUST GRILLES AND REGISTERS

- A. Square and Rectangular: Steel or extruded aluminum construction, 40 degrees fixed deflection, surface-mounted.
 - 1. Opposed blade damper, as scheduled.
 - 2. Finish: White.
 - 3. Reversible bar aluminum bar grilles, as scheduled.
- B. Heavy Duty Aluminum Wall Grille and Register: Heavy duty extruded aluminum construction, 1/8" face bars, 1/3" O.C., 30 degree fixed deflection down, extruded aluminum frame.
 - 1. Opposed blade damper, as scheduled.

2.5 SUPPLY REGISTERS

- A. Square and Rectangular: Aluminum construction, double-deflection, streamlined bars spaced 1/2" O.C., 1 1/4" margin, and gasket seals.
 - 1. Opposed blade damper, as scheduled.

2.6 LINEAR SLOT DIFFUSERS

- A. Insulated Plenum Slot Diffusers: Steel construction, insulated plenum with linear slot diffusers for 1 or 2-way throw at ceiling. T-bar mounted or surface mounted with flanged frame.
 - 1. Opposed blade damper, as scheduled.
 - 2. Finish: White.
 - 3. Notched center for 48 inch diffusers, as scheduled.
 - 4. Provide center T-bar, as scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate with other work, including ceiling layout, ductwork and ductwork accessories, as necessary to interface installation of air diffusers properly with other work.
- B. Install items in accordance with manufacturer's printed instructions.
- C. Paint ductwork visible behind air outlets matt black.
- D. Diffusers:
 - 1. At each duct drop or take-off to individual diffusers, locate extractor or scoop.
 - 2. Support diffusers adequately for type of ceiling receiving diffusers.
 - 3. Adjust diffuser air pattern as required to provide draft less uniform air distribution.
- E. Grilles and Registers:
 - 1. Secure overlapping frame of register or grille to screen, flange, or angle of ductwork with countersunk screws.
 - 2. Locate wall registers and grilles minimum 6 inches below ceiling, unless otherwise indicated.
 - 3. Locate separate accessible balancing volume damper at each register or grille in addition to control damper integral with register or grille.
 - 4. Adjust registers and grilles to provide draft less uniform air distribution.
- F. Louvers:
 - 1. Coordinate required wall openings with other trades.
 - 2. Turn over louver to General Contractor for installation.
 - 3. Verify proper opening requirement with General Contractor.
 - 4. Caulking and waterproofing by General Contractor.

3.2 FIELD QUALITY CONTROL

- A. Test and operate installed outlets and inlets to demonstrate compliance with requirements.

END OF SECTION

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SECTION 23 90 00 - CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Includes:

1. Complete system of Direct Digital Automatic controls system.
2. Complete integration into existing Alerton network at City-County Building
3. Electrical control system.
4. Control devices, components, wiring and material.
5. Instructions for users.

1.2 DESCRIPTION OF WORK

- A. Extent of controls and instrumentation work is indicated on drawings and schedules and by requirements of this section.
- B. Integrate the new DDC control work onto the existing Alerton BACnet network. The existing City-County Building service contract is with Environmental System Inc. Contact Jerry Gitlewski @ 262-832-1308 for Alerton Network information and building automation expansion requirements.
- C. Control system shall replace existing pneumatic VAV box controller and perimeter steam radiation to DDC controls and schedule VAV box operation based on associated occupied AHU schedule.
1. Provide override buttons on all space sensors for override of AHU operation during evening and otherwise unoccupied periods.
- D. Control system shall modulate steam perimeter radiation with a new 2-way steam valve in sequence with associated VAV box.
- E. Instruction of Owner's personnel.

1.3 RELATED WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
1. 23 05 00 HVAC General Provisions
 2. 23 05 90 Testing, Adjusting and Balancing
 3. 23 96 00 Starting of Mechanical Systems
 4. Division 26 Electrical

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. National Electrical Code, NEC
 2. National Electrical Manufacturers Association, NEMA
 3. Underwriter's Laboratories, UL
- B. All equipment provided, including control panels, dampers, valves, controllers, transmitters, sensors and other control devices shall bear the manufacturer's nameplate.

- C. Entire control system including piping and wiring shall be installed by mechanics specifically authorized by the Temperature Control equipment manufacturer for the installation and having acceptable experience installing and servicing similar control equipment.
- D. Acceptable Manufacturers:
 - 1. Alerton Controls - BACnet protocol.
- E. Guarantee: Guarantee the controls and instrumentation to maintain the temperature within one degree of the setpoint and further guarantee all work, materials, equipment, and controls against defects in workmanship and material, and provide service for a period of one (1) year from date of final acceptance.

1.5 SUBMITTALS

- A. Shop Drawings:
 - 1. Schematic control diagrams giving specific data on all settings, ranges, action, adjustments, and normal positions.
 - 2. Wiring diagrams detailed adequately for field construction and include all related wiring.
 - 3. Control valve and damper schedules with complete sizing data giving required design flow and temperature or pressure, and any other pertinent data.
 - 4. Sequence of operation for each system corresponding to control schematics.
 - 5. Panel drawings including complete internal wiring and piping schematics and complete data on all mounted components.
 - 6. Damper operator schedule, listing quantity, size of operators and mounting arrangement.
 - 7. Space thermostat sensor schedule indicating types of covers and adjustment means for each space.
- B. Control Diagrams:
 - 1. Furnish and mount in each equipment room or space prints of schematic control diagrams and corresponding sequences of operation for all systems located therein.
 - 2. Diagrams and sequences mounted in frames under clear plastic and located in easily visible location or as directed by A/E.
- C. Product Data:
 - 1. Submit published descriptive data on each item of equipment and accessories.
 - 2. Submit manufacturer's installation instructions.
- D. Report:
 - 1. At completion of work, submit report of check-out of automatic control system.
 - 2. Report actual setpoints with record drawings.

1.6 CALIBRATION AND ADJUSTMENTS

- A. After completion of the installation, perform final calibrations and adjustments of the control equipment provided under this contract and supply services incidental to the proper performance of the automatic control system under warranty.
- B. Submit letter to Engineer indicating all controls are calibrated and operating per sequence of control.

1.7 SYSTEM START-UP AND ACCEPTANCE PROCEDURE

- A. Upon completion of the calibration, the Control Contractor shall start up the system and perform all necessary testing and run diagnostic tests to ensure proper operation. Control Contractor shall be responsible for generating all software and entering all database necessary to perform the sequence of control and specified software routines. An acceptance test in the presence of the Owner's representative or engineer shall be performed.

1.8 OWNER TRAINING

- A. Provide sufficient but not less than 2 hours of training to the Owner's representatives, concerning the proper operation and maintenance of all control systems, sensing, monitoring and control equipment. Training sessions shall be conducted during normal business hours after system start-up and acceptance by the Owner.
- B. Submit operating and maintenance manuals to Owner a minimum of five (5) working days prior to training session. Use these manuals as the basis for instruction at all training sessions.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Factory shipping cartons for each piece of equipment.
- B. Factory-applied plastic end caps on each length of pipe and tube.
- C. Maintain cartons and end caps through shipping, storage and handling as required to prevent equipment and pipe-end damage, and to eliminate dirt and moisture from equipment and inside of pipe and tube.
- D. Where possible, store equipment and materials inside and protected from weather.
- E. When necessary to store outside, elevate well above grade and enclose with durable waterproof wrapping.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Provide complete control systems consisting of thermostats, sensors, control valves, dampers, operators, indicating devices, interface equipment, and other apparatus required to operate mechanical system and to perform functions specified and in compliance with the sequence of operations described herein.
- B. Provide necessary materials, labor and field work necessary to connect control components factory supplied as part of equipment controlled.

2.2 COORDINATION OF TEMPERATURE CONTROL WORK

- A. Electric Wiring: All electric wiring in connection with the automatic temperature control system shall be furnished and installed by the Controls Trade, except for equipment starter interlocks, which are the responsibility of the Electrical Trade.
 - 1. All 120 (line) volt or larger electrical service wiring and connections to equipment and motor starters is the responsibility of the Electrical Trade.
 - 2. All additional line voltage power requirements beyond which is indicated on the Drawings and Specifications for the temperature control system shall be the responsibility of the Controls Trade.

- B. Valves and Piping Wells: Furnish by Controls Trade, installed by HVAC Trade under supervision.
- C. Dampers, Valves, Actuators and related Controlled Devices: Furnished by Controls Trade, installed by HVAC Trade under supervision.

2.3 CONTROL VALVES

- A. Water Valves:
 - 1. Furnish all modulating straight-through water valves with equal-percentage contoured throttling plugs. Furnish all three-way valves with linear throttling plugs such that the total flow through the valve shall remain constant regardless of the valve's position.
 - 2. Valves 2" and smaller shall be screwed type, forged or cast brass, 125 PSIG rated, stainless steel stems, synthetic elastomeric or teflon packing.
- B. Steam Valves: 2-way globe stainless steel trim equal to Belimo G2-S with LF series actuator.

2.4 ELECTRIC CONTROL ACTUATORS

- A. Electronic Actuators shall be sized to operate their appropriate dampers or valves with sufficient reserve power to provide smooth proportional action or two-position action as specified.
 - 1. Modulating Valves: Valve actuators shall accept proportional 0-10 VDC or 0-20 mA signals for modulating action.
 - 2. Two-Position Valves: May be provided at radiation valves or convectors.
 - 3. Three-way Valves: Air handling unit water coils.
- B. Provide positive position sequencing relays for accuracy and non-overlapping operation of two or more actuators where required system design function.
- C. Actuators shall be designed to allow replacement of seal glands without draining the piping system.
- D. Acceptable Manufacturers: Belimo or approved equal.

2.5 NORMAL POSITIONS

- A. Regardless of type of system, each device shall assume specified normal positions on power failure.
- B. Normal positions shall be safe positions and as follows:
 - 1. Outside and Relief/Exhaust Air Dampers: Normally closed.
 - 2. Return Air Damper: Normally open.
 - 3. Automatic Control Valves: Normally open - full flow thru heat transfer device.
 - 4. Terminal Heating Valves: Normally open valve position; spring-return to full flow thru heat transfer device.

2.6 CONTROL DAMPERS

- A. The control trade shall furnish all control dampers as shown on the plans and/or as required to perform the control sequence specified except those furnished with fan equipment.
- B. All modulating dampers shall be sized by the control trade to meet flow requirements of the application in accordance with his recommendation. All two-position dampers to be sized as close as possible to duct size, but in no case is damper size to be less than 90% of duct area.

- C. Unless otherwise indicated, all control dampers shall be opposed blade type. Two position dampers may be parallel blade type.
- D. All dampers shall be factory fabricated and shall be standard products of the control manufacturer.
- E. Damper frames shall not be less than 13 gauge galvanized steel or extruded aluminum of 12 gauge. Blades shall not be less than 16 gauge galvanized steel or 14 gauge aluminum, not over 8 inch width with steel trunnions mounted in a bronze sleeve or ball bearings.
- F. All blade linkage hardware shall have corrosion-resistant finish and be readily accessible for maintenance.

2.7 ELECTRICAL EQUIPMENT REQUIREMENTS

- A. Provide electrical devices and relays that are UL listed and of a type meeting current and voltage characteristics of the project.

2.8 SENSORS/TRANSMITTERS

- A. Temperature Sensors (Room): Use a surface mount zone temperature sensor housed in a durable, ventilated plastic wall-mount enclosure, with broad aluminum faceplate. The sensing element to be a 1,000 ohm RTD (nickel or silicon) 0-10 VDC, or 4-20 MA accuracy +/- 1/2% span.
 - 1. Adjustable setpoint space thermostats with LED readout and setpoint information consistent with the other thermostats in the City-County Building DDC system.
 - 2. Unoccupied override button at sensor.
- B. Temperature Sensors (Discharge and Return Duct): Use a surface mount duct temperature sensor housed onto a standard metal handibox. The sensing element to be a 10,000-ohm RTD (nickel or silicon) 0-10 VDC, or 4-20 MA. House sensor in an 8-1/2" stainless steel probe. Accuracy +/- 1/2% span.
- C. Temperature Sensor (Mixed Air - Averaging): Select an averaging capillary type sensor housed on a standard metal handibox. The capillary type sensor to house no less than five sensing elements, which will return an average of the five or more sensor elements. The sensing elements are to be a 1,000-ohm RTD (nickel or silicon) 0-10 VDC, or 4-20 MA. Accuracy +/- 1/2% span.
- D. Immersion type temperature sensors: Rod and tube type with linear output. Provide separable thermo wells with heat conductive fluid for installation in pipeline. Units shall be factory calibrated.

2.9 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

- A. Each Digital Panel shall be able to extend its performance and capacity through the use of standalone Application Specific Controllers (ASCs).
- B. Each ASC shall operate as a standalone controller capable of performing its specific control responsibilities independently of other controllers in the network. Each ASC shall be of microprocessor-based, multi-tasking, real-time digital control processor.
- C. Each ASC shall have sufficient memory to support its own operating system and data bases including:
 - 1. Control Processes
 - 2. Energy Management Applications
 - 3. Operator I/O (Portable Service Terminal)

- D. The operator interface to any ASC point data or programs shall be through the Digital Panel or portable operator's terminal connected to any ASC on the network.
- E. ASCs shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following:
 - 1. Display temperatures
 - 2. Display status
 - 3. Display setpoints
 - 4. Display control parameters
 - 5. Override binary output control
 - 6. Override analog setpoints
 - 7. Modification of gain and offset constants
- F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.
- G. Application Descriptions:
 - 1. Unitary Controllers:
 - a. Unitary Controllers shall support, but not be limited to, the following types of systems to address specific applications described in the "Execution" portion of this specification, and for future expansion:
 - 1.) VAV box with hot water reheat
 - b. Unitary controllers shall support the following library of control strategies to address the requirements of the sequences described in the "Execution" portion of this specification, and for future expansion:
 - 1.) Daily Schedules
 - 2.) Comfort/Occupancy Mode
 - 3.) Economy Mode:
 - Standby Mode/Economizer Available
 - Unoccupied/Economizer Not Available
 - Shutdown
 - 4.) Temporary Override Mode:
 - Temporary Comfort Mode (Occupancy-Based Control)
 - Boost (Occupant Warmer/Cooler Control)
 - c. Alarm Management: Each VAV Terminal Unit Controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

2.10 CONTROL SEQUENCE

- A. Systems shall perform in accordance with the following descriptions of the control strategy intent.
- B. BAS = Building Automation System (DDC Controls).
- C. VAV TERMINAL UNITS WITHOUT REHEAT

1. The VAV terminal units shall be individually controlled by a DDC VAV controller per VAV terminal unit. VAV box manufacturer shall provide flow ring with VAV box. The DDC controller, damper motor, and differential pressure transducer shall be supplied by the BAS Contractor and furnished to the terminal unit supplier for factory installation.
2. Room sensor working through the pressure independent DDC controller shall modulate open the box damper from minimum damper position to maintain space stat cooling setpoint.
 - a. Provide single minimum air flow for cooling as scheduled on the drawings.
3. Unoccupied: Provide unoccupied space setpoint for cooling. Air system shall be deactivated and VAV air valve shall close.
 - a. Local override switch at sensor shall allow override of central air handling unit unoccupied mode to occupied mode.

D. VAV TERMINAL UNITS WITH REHEAT AND PERIMETER RADIATION

1. The VAV terminal units shall be individually controlled by a DDC VAV controller per VAV terminal unit. VAV box manufacturer shall provide flow ring with VAV box. The DDC controller, damper motor, and differential pressure transducer shall be supplied by the BAS Contractor and furnished to the terminal unit supplier for factory installation.
2. The room sensor working through the pressure independent DDC controller shall modulate the box damper from minimum damper position and sequence reheat coil valve to maintain discharge air setpoint at 70 deg F heating and 75 deg F cooling with deadband. Discharge air shall be reset by the space sensor to satisfy the space conditions. Upon a further drop in space temperature below space setpoint for heating, controller shall sequence on perimeter radiation, where present.
 - a. Reset range 55 deg F - 100 deg F.
 - b. Provide single minimum air flow through deadband and dual maximum air flow for cooling and heating as scheduled on the drawings.
3. Unoccupied: Provide unoccupied space setpoint for heating and cooling. Air system shall be deactivated and perimeter radiation shall supply heat to the space to satisfy the unoccupied heating setpoint.
 - a. Local override switch at sensor shall allow override of central air handling unit unoccupied mode to occupied mode.
4. Morning Warm-Up: Reheat coil valve shall remain in 100% open position.

2.11 DDC POINT LIST

POINT DESCRIPTION	TYPE	OPERATION SCHEDULE	ALARM	FIELD DEVICE
<i>VAV TERMINAL UNITS(typical)</i>				
VAV BOX (TYP.)	ANALOG OUTPUT	MODULATE	--	AIR VALVE ACTUATOR
VAV BOX (TYP.)	ANALOG INPUT	AIR FLOW	H/L TEMP	CFM OF VAV BOX
REHEAT VALVE	ANALOG OUTPUT	MODULATE	--	REHEAT HW VALVE
RADIATION VALVE	ANALOG OUTPUT	MODULATE	--	RADIATION STEAM VALVE
SPACE TEMP	ANALOG INPUT	TEMP.	TEMP	SPACE SENSOR (typ)
SPACE TEMP	BINARY OUTPUT	ON/OFF	--	SPACE SENSOR OVERRIDE

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all control equipment, wiring and air piping in a neat and workmanlike manner.
- B. All immersion wells, pressure tapplings and any associated shut-off valves, flow switches, level switches and other such items furnished by the control manufacturer shall be installed by the mechanical contractor under the coordinating control and supervision of the control contractor.
- C. Install all control devices in an accessible location.
- D. Electrical Wiring: All electrical wiring for the automatic control system, excluding line voltage power to control panels, as indicated on the Drawings, shall be furnished and installed by the Temperature Control Contractor in accordance with this specification section. All the electrical sections of this specification and all applicable electric codes shall apply to the required work.
 - 1. Sensor and/or control wiring shall be provided with conduit independent of those used for high voltage, switches AC or other signals which may create interference or cause induced voltages which promote signal drift or reduced accuracy. Sensor and high voltage wiring may not be run in the same conduit.

3.2 INSTALLATION

- A. Check and verify location of thermostats, room sensors and other exposed control sensors with plans and piping details before installation. Locate thermostats and sensors 60 inches above floor.
 - 1. Isolated from exterior walls as recommended by manufacturer.
 - 2. Located where not exposed to direct rays of sun, and where not influenced by concealed or adjacent heating, domestic hot water piping or warm air currents.
- B. Valve tops, inserts or bonnets, sensors, thermostats, thermometers, gauges, and damper motors of all types:
 - 1. Provide with access doors and/or access panels, in building construction so that they may be readily removed, replaced and serviced.
 - 2. Access doors and access panels by HVAC Contractor.
- C. Control Wiring of all Kinds:
 - 1. All control wiring to be labeled at both ends identifying termination and origination point.
 - 2. In conduit and included with temperature control system.
 - 3. Concealed low voltage control wiring may be routed as cabling.
 - 4. Exposed control wiring shall be in EMT conduit.
 - 5. Conforming to all requirements of Electrical Specifications, Division 16.
- D. Locate controls, relays, instruments, switches, valves, devices and accessories so they are readily accessible for adjustment, service, and replacement or as indicated on the drawings.
- E. Install control valves horizontal with power unit up unless otherwise indicated. Maximum variation from vertical is 45 degrees.

- F. Locate, size and support temperature sensing elements in water streams to properly sense the representative temperature.
 - 1. For controlling, transmitting and indicating elements, sensing device located, sized and of the type to sense the average condition.
 - 2. Wells shall not obstruct the flow of the fluid being measure.
 - 3. Pipes 1" and smaller shall be increased at least one pipe size at point of insertion.
- G. Where insulation on piping, ductwork or equipment is punctured or penetrated due to the installation of sensing elements or tubing, reseal the openings air and vapor tight.
- H. Where control devices are to be located on insulated surfaces, provide brackets to clear the finished surface of the insulation avoiding punctures of the vapor seal.
- I. Locate support, enclose and install control devices and equipment so that they will not be subject to:
 - 1. Vibration
 - 2. Excessive temperatures
 - 3. Dirt, moisture or other harmful effects.
 - 4. Conditions beyond their rated limitations.
- J. Conceal all piping except piping in mechanical rooms and other areas where mechanical system piping may be exposed.
- K. Install all exposed piping and conduit parallel to or at right angles to the building structure and support adequately at uniform intervals. Use only tool made bends.
- L. Make tests on piping from time to time during the progress of installation to insure against leaks.

3.3 TESTING, ADJUSTING AND PERFORMANCE DEMONSTRATIONS

- A. All controlling devices which are a part of the automatic temperature control system, shall be tested and adjusted by the Contractor before system is offered for final acceptance.
 - 1. All associated devices, valves, operators and dampers adjusted.
 - 2. All operating and positioning of all dampers verified.
- B. After all calibrations, adjustment and checking have been completed and all systems are operational:
 - 1. Demonstrate to User's representative, the complete and correct functioning of all control systems and equipment.
 - 2. Demonstrations shall consist of operating the controls through their normal full ranges and sequences.
 - 3. Simulate abnormal conditions to demonstrate proper functioning of safety devices.
 - 4. Readjust all settings to their correct design values and after sufficient time, observe ability of controls to establish the desired conditions, noting any abnormal deviations.
 - 5. Make any necessary repairs, replacements or adjustments on all items which fail to perform satisfactorily, all to the satisfaction of the Owner's representative.
- C. Upon completion of the work and testing, but prior to final acceptance:
 - 1. A representative of the control system manufacturer shall spend such length of time as necessary to instruct the Owner's personnel in proper operation, adjustment and maintenance of the control equipment and systems.

2. Instruction shall be performed by competent, trained, full-time employees of the control system manufacturer who have a complete working knowledge of the systems and equipment installed in this job.

END OF SECTION

SECTION 23 96 00 - STARTING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Contractor:

1. Provide material and labor required for start up of all equipment and systems installed under general contract.
2. Coordinate start-up work with pipe cleaning, pipe system leak tests, and initial system fill and venting.
3. Provide all information and assistance required for cooperation with testing, adjusting and balancing services.
4. Contractor shall coordinate start-up of mechanical equipment with manufacturer's representative to be present for supervision and certification of correct operating procedures.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

- | | | |
|----|----------|----------------------------------|
| 1. | 23 05 90 | Testing, Adjusting and Balancing |
| 2. | 23 06 00 | Pipe and Pipe Fittings |
| 3. | 23 63 00 | Water Treatment |
| 4. | 23 74 00 | Terminal Air Distribution Units |
| 5. | 23 90 00 | Controls and Instrumentation |

1.3 START-UP PROCEDURES

A. Bearings:

1. Inspect for cleanliness, clean and remove foreign materials.
2. Verify alignment.
3. Replace defective bearing and those which run rough or noisy.
4. Lubricate as necessary in accordance with manufacturer's recommendations.

B. Motors:

1. Check each motor for amperage comparison to nameplate value.
2. Correct conditions, which produce excessive current flow, which exist due to equipment malfunction.

C. Drives:

1. Adjust tension in V-belt drives, and adjust vari-pitch sheaves and drives for proper equipment speed.
2. Adjust drives for alignment of sheaves and V-belts.
3. Clean and remove foreign materials before starting operation.

D. Pumps:

1. Check mechanical seals for cleanliness and adjustment before running pump.
2. Inspect shaft sleeves for scoring.
3. Inspect mechanical faces, chambers and seal rings; replace if defective.
4. Verify that piping system is free of dirt and scale before circulating liquid through pump.
5. Clean suction strainers.

E. Control Valves:

1. Inspect hand and automatic control valves, clean bonnets and stems.
2. Tighten packing glands to assure no leakage, but permit valve stems to operate without galling.
3. Replace packing on any valve, which continues to leak.
4. Remove and repair bonnets, which leak.
5. Coat packing gland threads and valve stems with surface preparation after cleaning.
6. Verify that control valve seats are free from foreign materials and are properly positioned for intended service.

F. Water Systems:

1. Tighten flanges after system has been placed in operation. Replace flange gaskets, which show signs of leakage after tightening.
2. Inspect screwed joints for leakage. Promptly remake each joint, which appears to be faulty; do not wait for rust to form.
3. After water system has been placed in operation, clean strainers, dirt pockets, orifices, valve seats and headers in fluid systems to assure being free of foreign materials.
4. Remove rust, scale and foreign materials from equipment and renew defaced surfaces.
5. Inspect each electrical control circuit to assure that operation complies with specifications and requirements to provide desired performance.
6. Inspect each pressure gauge and thermometer for calibration. Replace items defaced, broken or read incorrectly.
7. Repair damaged insulation.

G. Air Systems:

1. Set and calibrate draft gages of air filters and other equipment.
2. Replace filter media with new clean units.
3. Inspect fan wheels for clearance and balance. Provide factory-authorized personnel for adjustment when needed.
4. Check each electrical control circuit to assure that operation complies with specifications and requirements to provide desired performance.

H. Adjustments:

1. Provide such periodic continuing adjustment services as necessary to insure proper functioning of mechanical systems after occupancy of the Project, and for a period of one year after Date of Substantial Completion.
2. Note: Adjustment services are not maintenance services.

PART 2 - PRODUCTS

--- NOT USED ---

PART 3 - EXECUTIONS

--- NOT USED ---

END OF SECTION

SECTION 26 05 00 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Applicable provisions of Division 1 shall govern Work under this Section.
- B. Furnish all labor, materials, equipment and accessories required to complete all electrical work as shown on the Drawings and specified herein, and shall include, but is not necessarily limited to:
- 26 05 00 Electrical General Provisions
 - 26 10 00 Electrical Demolition and Alterations
 - 26 11 00 Raceways and Boxes
 - 26 12 00 Low Voltage Conductors and Cables
 - 26 14 00 Wiring Devices
 - 26 16 20 Panelboards
 - 26 19 00 Supporting Devices
 - 26 45 00 Grounding and Bonding
 - 26 51 00 Interior Building Lighting
 - 26 51 10 Lighting Control Systems
 - Division 27 Communications
 - Division 28 Electronic Safety and Security
- C. Work Included in Division 26:
1. General: The mention hereinafter of article, operation, material, equipment or method requires that the E.C. shall provide such article of quality noted, in the quantity required, shall perform each operation, and use such method, material or equipment prescribed, all in complete accordance with the conditions stated. The E.C. shall provide all materials, labor, tools, equipment and transportation as necessary to complete the project in conformity with the drawings, the specifications, and other Contract Documents. In general, this work includes everything essential for a complete electrical system in operating order as shown or implied on the drawings or hereinafter specified.
 2. All work shall be in accordance with all Local & State Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and connected by the E.C. All materials shall bear a UL label where a UL Standard and/or test exists.
 3. Before submitting his bid, each bidder shall examine the drawings relating to this work and shall become fully informed as to the extent and character of the work required and its relation to other work in the building. No consideration will be granted for any alleged misunderstanding of materials to be furnished or work to be done, it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein or indicated on the accompanying drawings.
 4. The E.C., in conjunction with the Engineer's representative, shall establish exact location of all materials and equipment to be installed in consideration of construction features, equipment of other trades and requirements and purpose of equipment installed by the E.C.
- D. Summary of Electrical Work:
1. Drawings and Specifications: Electrical drawings are schematic. Minor relocations of these items may be made by the Engineer prior to rough in at no expense to the Owner.
 2. Any conflict between the drawings and specifications shall be brought to the attention of the Engineer.

3. Note that the electrical drawings are only a portion of the complete set of plans. The complete set of plans shall be used to define the electrical work.
4. The complete specifications will be utilized to define the electrical work.
5. General Outline: The facilities and systems of the electrical work can be described (but not by way of limitation) as follows:
 - a. Demolish and remove electrical equipment, light fixtures, raceways and conductors.
 - b. Remove and replace panelboard.
 - c. Provide new lighting, electrical devices and distribution.
 - d. Support Studio Lighting system power and raceways.
 - e. Provide Communications cabling and raceways.
 - f. Extend existing fire alarm system to remodeled space.
 - g. Support security system installation with raceways required.

E. Coordination of Electrical Work:

1. General: The Contractor shall confer with the other trades and the Engineer so that all concerned will be thoroughly familiar with the specific items and areas of the coordination.
2. Conflicts of any type shall be immediately reported to the Engineer.
3. The Contractor shall furnish and be responsible for the proper installation of all reinforcement required for wall or ceiling attached equipment.
4. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction.
5. Locate operating and control equipment properly to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance.
6. All conduit shall be concealed except in mechanical and electrical rooms.

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

- A. Provide: Furnish and install, complete and ready for service.
- B. Exposed: Exposed to view in any room, corridor or stairway.
- C. E.C.: Electrical Contractor.
- D. The Engineer: HEIN Engineering Group.
- E. The Owner: City of Madison
- F. A/E: Architect/Engineer.
- G. ANSI: American National Standards Institute
- H. NEC: National Electric Code
- I. NEMA: National Electric Manufacturers Association
- J. NFPA: National Fire Protection Association
- K. UL: Underwriters Laboratories, Inc.

1.4 PERMITS AND LICENSES

- A. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and working drawings required by them. Secure and pay for all licenses and permits required.

1.5 QUALITY ASSURANCE, STANDARDS AND SYMBOLS

- A. General: Specifically, for the electrical work (in addition to standards specified in individual work section), the following standards are imposed, as applicable to the work in each instance:
1. Standards for Materials and Workmanship: All materials shall conform to the standard of the UL in every case where the UL has established a standard of such materials. In addition, these materials shall bear the UL label to show their conformance. Materials not covered by UL standards shall be processed, supplied or manufactured to NEMA, IEEE, or other accepted industry standards for these materials and shall also be labeled or properly identified as being in conformance with the appropriate standards. Substitute standards for those listed are not acceptable. Materials and equipment shall be protected during delivery and handling to prevent damage; and shall be stored in a clean dry area to prevent contamination. Damaged materials shall not be used.
 2. All materials and work shall conform to the applicable portions of the latest issues of the following standards:
 - a. UL
 - b. NEMA
 - c. NEC
 - d. NECA
 - e. ANSI
 - f. IEEE
 - g. ASTM
 - h. NFPA
 - i. IPCEA
 - j. FM
 - k. ETL
 3. All work shall be installed in accordance with National and State laws, ordinances and regulations. Comply with all applicable OSHA regulations.
 - a. IBC
 - b. IECC
 4. All materials shall have a UL label where a UL Standard and/or test exists.
 5. All work shall be executed in a neat and workmanlike manner by workers thoroughly qualified in the trade of duties they are to perform. A rough or unworkmanlike installation will be cause for removal and replacement of said installation.
- B. Substitution of Materials:
1. All requests for substitution shall be in writing and shall include sufficient product information to permit the Architect/Engineer to evaluate the request.
 2. The Architect/Engineer specifically reserves the right to reject or approve any and all substitute materials or equipment in order to insure compliance with the minimum standards of quality established for the project herein specified, and also to insure that any substitute materials or equipment maintains the trends of style and appearances established for this project.
 3. When an item is approved as an equal, either by specification or by approved substitution, this item shall give the same end results, to the Architect/Engineer's satisfaction, as the item it has replaced from the specification. Any modification, additional fittings or change to the approved item or to concomitant items to accomplish these results shall be at the expense of the Contractor.
 4. The Contractor shall choose from the listed manufacturers for specific items or a substitute manufacturer if approved, but once a manufacturer has been chosen all similar items shall be by the same manufacturer.

1.6 JOB CONDITIONS

A. Job Site:

1. The Contractor shall be familiar with conditions which will affect his work, and locations where the work will be performed and other pertinent factors.
2. The Contractor shall furnish all labor and materials to complete each installation ready for use.
3. No additional allowances will be granted because the Contractor's knowledge of job site conditions was incomplete.

B. Products, Electrical Work:

1. Product Listing: Prepare the product listing for electrical work. Include listing of each significant item of equipment and material used in the work; and indicate the generic name, product name, manufacturer, model number, related specification number(s).
 - a. Submit list to the Architect/Engineer for approval.
2. Compatibility: Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with the other work.

1.7 WORK SEQUENCE

- A. The Contractor shall review the work sequence and determine if any dates of completion can not be met for his work. Any conflicts with completion dates shall be brought to the Engineer's attention prior to submitting a bid. No time extensions will be granted after contracts are awarded unless permitted in other parts of these specifications.

1.8 DIMENSIONS AND DEFINITE LOCATIONS

- A. The drawings depicting electrical work are diagrammatic and depict, in their approximate location, symbols representing electrical equipment. The exact location shall be established in the field in accordance with instructions from the Architect.
- B. Unless specifically stated to the contrary, no measurement of an electric drawing by scale shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject, in each case, to measurements of adjacent or previously completed work and all such measurements necessary shall be taken before undertaking any work dependent upon time.

1.9 DRAWINGS

- A. The E.C. shall prepare, at his expense, complete field installation drawings necessary for the proper installation of his work. These drawings shall be submitted to the Engineer when requested for review and such copies of same as are necessary shall be provided for others as directed.
- B. The E.C. shall keep a detailed record, up-to-date, of the manner and location in which all installations are actually made, properly indexing each feeder, pull box and protective device.
- C. As Built Drawings: See General Requirements - Division 1.
- D. In the event of a conflict between the drawings and specifications the E.C. shall base his bid on the greater quantity, cost or quality of the item in question, unless such conflict is resolved by addenda.

1.10 MATERIALS AND EQUIPMENT

- A. Provide all new materials and equipment to form a complete installation, unless otherwise specified.
- B. All equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions will be allowed except as provided in Instructions to Bidders.
- C. All items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute current product.

1.11 FLOOR, WALL AND CEILING OPENINGS

- A. Pipe sleeves must be set for all pipes passing through new masonry construction. Coordinate with G.C. as to size and location of openings.
- B. Coordinate the location of sleeves, openings, chases, furred spaces, etc., with the other Contractors. Provide all sleeves, hangers and inserts that are to be built into the structure during the progress of construction.
- C. Pipe sleeves shall be Schedule 40 galvanized steel pipe and shall extend completely through the construction.
- D. Sleeves for pipe 4" and smaller shall be at least two pipe sizes larger than the pipe passing through.
- E. Sleeves shall extend 3/8" above the finished floor. In mechanical rooms and other areas where water may accumulate, sleeves shall extend 2" above the finished floor.
- F. Pack annular space between sleeves and insulation or pipe with fiberglass. Where penetrations occur through mechanical rooms or fire rated walls, floors, fill with Dow-Corning 3-6548 Silicone RTV Foam.

1.12 SHOP DRAWINGS

- A. Submit to Engineer for review, in accordance with Division 1, shop drawings and/or equipment brochures for the following:
 - 1. Raceways and Boxes.
 - 2. Low Voltage Conductors and Cables.
 - 3. Wiring Devices.
 - 4. Light Fixtures.
 - 5. Lighting Controls.
- B. Submit in advance of construction requirements and as to cause no delay in the E.C.'s work and to allow the Engineer reasonable time to review them to make necessary corrections.
- C. All data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear the name and location of the project, the name of the E.C., the date of submittal, the date of the drawings and the date of each correction and revision. If more than one type of lighting fixture (or other materials) are on submitted sheet, the one specified shall be conspicuously checked with red pencil by the E.C.

1.13 DELIVERY STORAGE AND HANDLING

- A. All materials shall be suitably stored and protected prior to installation and all work shall be protected after installation, during construction and all work prior to acceptance.

- B. The E.C. shall furnish and remove upon completion of the project, all scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of all equipment and apparatus required to be installed by the E.C.

1.14 MAINTENANCE MANUALS

- A. The E.C. shall assemble and submit to the Architect for subsequent submission to the Architect/Engineer, in accordance with Division 1, complete sets of a Manual of Operation and Maintenance for each of the separate systems furnished as a part of the electrical subcontractor.
- B. Each manual shall consist of an approved loose-leaf type bound volume instructing the Architect/Engineer's personnel in the use, operation and maintenance of the system in question. The manual shall cover all phases of operation of the equipment and it shall be illustrated with photographs, drawings, wiring diagrams, etc., as required to accurately and adequately describe the operation, construction and adjustable features of the complete system and each component part. The manual shall be complete with an equipment parts listing to facilitate the ordering of spare and replacement parts.
- C. Each manual shall contain two sets of final shop drawings depicting equipment as installed.
 - 1. Equipment Parts Lists: Include a complete list of all equipment furnished for project, with a tabulation of descriptive data of all the equipment replacement parts proposed for each type of equipment or system. Properly identify each part of part number and manufacturer.

1.15 CLEANING AND PAINTING

- A. All rubbish resulting from this work shall be removed and disposed of on a daily basis and in such manner as to be acceptable to the Architect.
- B. The E.C. shall clean all exposed ironwork, interior and exterior of panels and pull boxes, etc., and remove all rubbish and debris resulting from the work.
- C. Where painted surfaces of equipment have been abused, removed, or rusted during construction, the E.C. shall paint same to match original factory or surrounding finish.

1.16 TESTS AND ACCEPTANCE

- A. The operation of the equipment and electrical installations done does not constitute an acceptance of the work by the Architect/Engineer. The final acceptance is to be made after the E.C. has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.
- B. After the work is completed and prior to acceptance, the E.C. shall conduct the following tests, tabulate data, date, sign and submit to the Engineer: clamp ammeter test on each feeder conductor with all utilization equipment energized. The load current in each phase conductor of the feeder of the portion thereof supplying the panel shall not differ from the average connected load currents in the several conductors by more than 10%. If the load current does differ by more than 10%, the E.C. shall change phase loading to same or receive written approval from the Engineer that this is not required due to the nature of the load.
- C. At the time of connection, or energizing, check all motors for proper rotation, conferring with contractor furnishing equipment, if necessary, to determine proper direction.
- D. Upon completion of the installation, the E.C. shall furnish certificates of approval from all authorities having jurisdiction. He shall demonstrate that all work is complete and in perfect operating condition, with raceway and conduit system properly grounded, all wiring free from grounds, shorts, and that the entire installation is free from any physical defects. In the

presence of the Engineer and the Architect/Engineer, the E.C. shall demonstrate the proper operation of all miscellaneous systems.

- E. All materials and workmanship is subject to inspection, examination and tests by the Architect/Engineer at any time.

1.17 EXTRA STOCK/SPARE PARTS

- A. None anticipated for electrical work.

1.18 DEFECTS

- A. Should it be found by the Engineer that the fixtures, equipment or any portion thereof furnished and installed under this subcontract fail to comply with the specifications and drawings, with respect or regard to the quality, amount of value of material, appliances or labor used in the work, it shall be rejected and replaced by the E.C. and all work disturbed by changed necessitated in consequence of said defects or imperfections shall be made good at the E.C.'s expenses.

1.19 WARRANTY

- A. The Contractor shall warranty: All materials furnished to be perfect in every respect; and, if not, replace same immediately. Replace any material or part showing defects within a minimum of one year of acceptance, or within warranty period of the item if greater than one year. This one-year warranty period shall be binding even though it may exceed the product warranty period normally furnished by some manufacturers. Repair or replacement shall bear an additional 12 months warranty as called for, dated from final acceptance of the repairs or replacement. The apparatus to be installed in strict accordance with these specifications and the various codes covering this work. Neither the final acceptance nor any provisions in the Contract Documents shall relieve this Contractor of the responsibility for negligence, faulty materials or workmanship within the extent and period provided by this contract.

1.20 IDENTIFICATION

- A. General:
 - 1. Materials and equipment shall be clearly identified as listed below.
 - 2. Locate identification conspicuously.
 - 3. Terminology to be approved by Architect.
 - 4. See plans for any additional items to be identified.
 - 5. Loads such as motors shall be described by function rather than by the system of arbitrary number as shown on electrical plans.
 - 6. Use abbreviations sparingly.
- B. All panels and cabinets shall be stenciled with 2" letters indicating usage, plan designation and voltage. In Equipment and Mechanical Rooms this identification may be on the exterior of unit; in other areas identification shall be inside door or cover.
- C. Junction and pull boxes shall be stenciled utilizing a coded identification system. The following junction and pull boxes shall be identified using a coded system. Coding shall be submitted to Engineer for approval.
 - 1. Light and Power - 120/208V.
 - 2. Fire Alarm.
- D. On all 3-phase systems, each phase shall be identified at all terminals using code markers.

- E. Laminated Bakelite Plates: Engraved plastic nameplate shall be securely fastened to the following equipment. Size 1" x 4" with 3/8" high letters unless space available dictates differently.
1. Each section of main distribution switchboards and panelboards. Mount one next to each protection device to identify load served by each circuit breaker.
 2. Each contractor, time switch, metering cabinet, starter, motor disconnect switch. In Equipment and Mechanical Rooms this identification may be on the exterior of unit, in other areas identification shall be inside door or cover.
 3. Each feeder at all accessible locations, i.e., panels, junction boxes, pull boxes, etc. (strap plate to feeder conductors in junction boxes or pull boxes).
 4. Each end of empty conduit runs to indicate the intended use of the conduit and the location of opposite end. Use room numbers that are permanently assigned.
- F. Typewritten Directory: Each panelboard shall be provided with a typewritten directory in a steel frame with plastic cover contained on the inside of panel door. These directories shall indicate load served and rooms served by each protective device in the respective panel.
- G. Conductor Identification:
1. Identify each conductor at each conductor or splice point with permanently attached wrap around adhesive markers as manufactured by Brady Company.
 2. This identification shall include branch circuit number, control circuit number, or any other appropriate number or lettering that will expedite future tracing and "trouble shooting".
 3. All wire shall be color-coded per the NEC. In addition, color-coding shall be used to identify phases, neutral, ground and voltages. Coding shall be:

120/208V	- Phase A - Black
	- Phase B - Red
	- Phase C - Blue
	- Neutral - White
	- Ground - Green

1.21 ACCESS PANEL

- A. Access panels required by code or otherwise to electrical equipment shall be provided by Electrical Contractor. Access panels shall be in accordance with Division 1 complete with master cylinder lock.

PART 2 - PRODUCTS

--- Not Used ---

PART 3 - EXECUTION

--- Not Used ---

END OF SECTION

SECTION 26 10 00 - ELECTRICAL DEMOLITION AND ALTERATIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- A. Applicable requirements of Division 1 shall govern work in this section.

1.2 JOB CONDITIONS

- A. The Electrical Contractor shall work with WPS(Electrical Utility) to coordinate the disconnection of the all electrical services to the building. It is the responsibility of the demolition contractor for demolition of any interior electrical equipment. The Electrical Contractor shall verify for demolition contractor that all electrical equipment is de-energized prior to demolition.
- B. Prior to demolition or alteration of structures, the following shall be accomplished:
1. Owner release of such structure.
 2. Disconnection of electrical power to equipment and circuits removed or affected by demolition work.
 3. trical services rerouted or shut off outside area of demolition.
 4. Coordinate sequencing with Owner and other Contractors.
 5. Survey and record condition of existing facilities to remain in place that may be affected by demolition operations. After demolition operations are completed, survey conditions again and restore existing facilities to their predemolition condition.
- C. Remove all and any unused materials not complying or reused with new electrical plan.
- D. Contractor shall dispose of all obsolete material.
- E. Contractor shall notify the Engineer of any existing code violations observed during the course of performing his work. The Engineer will decide if corrective action needs to be taken. Corrective actions that change the scope of the work will be considered a change order and will be processed accordingly.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 ELECTRIC SERVICE

- A. De-energize existing electric service serving remodeled as required to install new equipment with proper notice to General Contractor and Owner prior to starting shutdown.
1. Refer to Division 1 for further requirements regarding continuation of existing services.

3.2 REMOVAL

- A. Remove or relocate conduit, wire, boxes, and fixtures.
- B. Remove electrical equipment released from service as a result of construction or as indicated on drawings.

- C. Do not reuse removed electrical equipment, unless specifically called out in the drawing documents.
- D. Where existing equipment is being removed, removal shall include all equipment associated with the device. Associated equipment shall include but not be limited to coverplates, backboxes, conduit, fittings, de-energized conductors, etc. When boxes are removed from existing walls which will remain, it shall be the Electrical Contractor's responsibility to fill in openings and sand as required flush with adjacent surfaces. The General Contractor shall be responsible for final finish work unless specifically indicated otherwise on the plans.

3.3 DISPOSAL

- A. Dispose of equipment that is removed unless specifically indicated on the drawings.
- B. Raceway, conductors, boxes, cabinets and supporting devices shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor.
- C. The Contractor shall tour demolition areas with the Owner to determine the status of all other equipment to be removed during demolition. All equipment that is to be salvaged for reuse by the Owner shall be removed by the Contractor and transported to an owner designated storage area on the site. The Owner shall be responsible for removal of salvaged equipment from the storage area.

3.4 ASBESTOS REMOVAL

- A. Any work involved with asbestos removal, disposal or abatement shall not be considered as part of this project. All work in this regard shall be the responsibility of the Owner. If this Contractor shall discover the presence of any asbestos material he shall cease work immediately and notify Owner and Engineer of condition.

END OF SECTION

SECTION 26 11 00 - RACEWAY AND BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide complete raceway system as specified for power distribution systems.
 - 1. Conduit, box and raceway systems.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 26 05 00 Electrical General Provisions
 - 2. 26 12 00 Low Voltage Conductors and Cables
 - 3. 26 19 00 Supporting Devices
 - 4. 26 45 00 Grounding and Bonding

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. National Electrical Code, NEC: Comply with NEC/NFPA No. 71 as applicable to construction and installation of electrical conduit.
 - 2. National Electrical Manufacturer's Association, NEMA: Comply with applicable portions of NEMA standards pertaining to non-metallic duct and fittings for underground installation.
 - 3. Underwriters Laboratories: Provide electrical conduit listed and labeled by UL.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Provide color-coded end-cap thread protectors on exposed threads of threaded metal conduit.
- B. Storage:
 - 1. Store pipe and tubing inside and protect from weather.
 - 2. When necessary to store outdoors, elevate well above grade and enclose with durable, watertight wrapping.
- C. Handle conduit and tubing carefully to prevent bending and end damage and to avoid scarring the finish.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Conduit:
 - 1. Allied Tube and Conduit Corporation.
 - 2. Wheatland Tube Company.
 - 3. Steelduct Conduit Products.

- B. Couplings:
1. Appleton Electric Company.
 2. Crouse-Hinds Company.
 3. Killark Electric Manufacturing Company.

- C. Flexible Conduit:
1. Anaconda Metal Hose.
 2. I.B.C. Corporation.
 3. Electri-Flex Company.

- D. Boxes:
1. Appleton Electric Company.
 2. Crouse-Hinds Company.
 3. General Electric Company.
 4. Killark Electric Manufacturing Company.
 6. Lew Electric Fitting Company.
 7. O.Z./Gedney Company.
 8. Raco, Inc.
 9. Square D Company.
 10. Steel City Division.
 11. Thomas and Betts Company, Inc.
 12. Wiremold/Walker.

2.2 CONDUIT MATERIAL

A. RIGID METAL CONDUIT AND FITTINGS

1. Conduit: Heavy wall, galvanized steel, schedule 40, threaded.
2. Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

B. INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

1. Conduit: Galvanized steel, threaded.
2. Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

C. ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

1. Conduit: Steel, galvanized tubing.
2. Fittings: All steel, set screw, concrete tight. No push-on or indenter types permitted.
Conduit Bodies: All steel threaded conduit bodies.

D. FLEXIBLE METAL CONDUIT AND FITTINGS

1. Conduit: steel, galvanized, spiral strip.
2. Fittings and Conduit Bodies: All steel, galvanized, or malleable iron.

E. LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

1. Conduit: flexible, steel, galvanized, spiral strip with an outer Liquidtight, nonmetallic, sunlight-resistant jacket.
2. Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression type. There shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

F. CONDUIT

1. Rigid Threaded: Steel, ANSI C80.1
2. Electrical Metallic Tubing: ANSI C80.3
3. Rigid Nonmetallic Tubing: Schedule 40 PVC; NEMA TC-2 & WC-1094

2.3 BOXES MATERIAL

A. OUTLET BOXES

1. Sheet Metal Outlet Boxes: galvanized steel, with stamped knockouts.
2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 3/8 inch male fixture studs where required.
3. Concrete Ceiling Boxes: Concrete type.
4. Cast Boxes: Cast ferroalloy, or aluminum type deep type, gasketed cover, threaded hubs.
5. Boxes:
 - a. Metallic hot-dipped galvanized, 1.25 oz. per square foot or cadmium plated.
 - b. Non-metallic, PVC thermoplastic or thermoset polyester.
6. Interior Boxes:
 - a. Pressed sheet steel, blanked for conduit.
 - b. Provide attached lugs for locating.
7. Exterior Boxes: Cast aluminum, deep type, corrosion proof fasteners, water tight, gasketed with threaded hubs.
8. For Ceiling: 4-inch octagon boxes for 1 fixture, including fixture studs and maximum 2 connecting conduits.
9. For Flush Mounting in Walls:
 - a. Boxes with matching plaster cover for single or two gang outlets.
 - b. Two-gang box or larger or deep masonry box for conductors, conductor joints, conduit terminations and wiring devices.
10. Surface Mounted: 4 inches square.

B. PULL AND JUNCTION BOXES

Pull boxes and junction boxes shall be minimum 4 inch square by 2-1/8th inches deep for use with 1 inch conduit and smaller. On conduit systems using 1-1/4 inch conduit or larger, pull and junction boxes shall be sized per NEC but not less than 4-11/16 inch square.

1. Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.
2. Sheet Metal Boxes Larger Than 12 Inches (300 mm) in any dimension shall have a hinged cover or a chain installed between box and cover.
3. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron or aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
4. Box extensions and adjacent boxes within 48" of each other are not allowed for the purpose of creating more wire capacity.
5. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.
6. Wireways shall not be used in lieu of junction boxes.
1. Pull Boxes and Junction Boxes: NEC metal construction with screw or hinged cover.

C. CONDUIT BODIES:

1. Galvanized or aluminum cast-metal of type, shape and size to fit each respective location.
2. Constructed with threaded conduit ends, removable cover and corrosion-resistant screws.

D. BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS: Provide corrosion-resistance punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushing, type and size to suit respective use.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION

- A. Wiring: All wiring shall be installed in raceways as herein specified. All raceway runs shown on the drawings are diagrammatic; exact locations shall be determined in the field.
1. Conceal all conduit in finished areas.
 2. Concealed raceways shall be installed in the walls, above ceilings, below floors or in furred out spaces so as to be completely concealed from view by occupants during their normal activities in use of the space.
 3. Exposed raceways shall be run in straight lines at right angles or parallel with walls, beams and columns.
 4. Provide raceways as required by the access control equipment controls for door operating and monitoring.
- B. Raceway Installation: All raceways, which are not buried or embedded in concrete shall be supported by straps, suitable clamps or hangers to provide a rigid installation. Perforated strap or wire hangers will not be acceptable. In no case shall raceways be supported or fastened to other pipe. No raceway smaller than 1/2" shall be used, except that light fixture switch legs may be 3/8".
1. Bends: Not more than three 90 degree bends will be allowed in one raceway run. Where more bends are necessary, a conduit or pull box shall be installed. All bends in 1" and smaller conduit or electrical metallic tubing shall be made with proper bender. All other bends shall be machine made.
 2. Joints: Joints in rigid metal shall be threaded type made up watertight with white lead or compound applied to male threads only and all field joints shall be cut square, reamed smooth and properly threaded to receive couplings. Electrical metallic tubing systems shall utilize watertight compression type fittings throughout. No indenter type fittings or running threads will be permitted.
 3. Locknuts: Double locknuts shall be provided on all conduit terminations with the exception of conduits terminating in threaded hubs and couplings. Locknuts shall be of a type that have sharp beveled teeth that dig into the metal when tightened and will not loosen through vibration.
 4. Bushing: Bushing shall be provided on all conduits with the exception of conduits terminating in hubs and couplings. Insulating bushings consisting of insulating inserts in metal housing shall be provided on all installations. Insulating bushings shall be grounding type where required by the National Electrical Code.
 5. Heating Ducts and Pipes: Care shall be used to avoid proximity to heating duct and hot water lines. Where such crossings are unavoidable, raceway shall clear covering or line by at least 6".
- C. Utilize rigid steel conduit or rigid nonmetallic conduit where exposed to moisture, buried in earth or in concrete.
- D. Utilize electrical metallic tubing(EMT) or intermediate metal conduit in other above-grade locations.
- E. For underground conduit: use PVC-coated rigid conduit or rigid non-metallic conduit.
- F. Connections:
1. Motors and equipment: Minimum 1/2" size; PVC jacketed flexible conduit and liquid-tight connectors.
 2. Flexible conduit sufficient length to avoid vibration transmission.
 3. Use 3/8" flexible conduit only for light fixture whips(72" max.)and control wiring.
 4. Coordinate service conduit connections with location of service transformers.
- G. Install conduit and tubing products as indicated, in accordance with manufacturers written instructions and applicable requirements of NEC and NEMA Standard and Installation.

- H. Install conduit concealed in all areas excluding mechanical, electrical and other unfinished rooms, connections to motors and connections to surface cabinets.
- I. Coordinate installation of conduit in masonry work.
- J. Do not install conduit larger than 1" in concrete slabs.
- K. Install conduit free from dents and bruises.
- L. Plug conduit end to prevent entry of dirt or moisture.
- M. Clean out conduit before installation of conductor.
- N. Alter conduit routing to avoid structural obstructions, minimizing cross-overs.
- O. Seal conduit with oakum or fiberglass where conduits leave heated area and enter unheated area.
- P. Roof Penetrations: Provide flashing and pitchpockets making watertight joints where conduits pass through roof or waterproofing membrane.
- Q. Building Expansion Joints:
 - 1. Install UL listed expansion fittings complete with grounding jumpers where conduits cross building expansion joints.
 - 2. Provide bends or offsets in conduits adjacent to building expansion joints where conduit is installed above suspended ceiling.
- R. Route all exposed conduits parallel or perpendicular to building lines.
- S. Allow minimum 6" clearance at flues, steam pipes and heat source.
- T. Underground Conduit: Direct burial minimum.
 - 1. Support multiple runs vertically and horizontally with plastic spacers 8' on center.
 - 2. Slope conduit to drainage point.
 - 3. Adjust final layout to coordinate with existing utilities.
 - 4. Trench and backfill as detailed on drawings.
 - 5. Encase conduit with 3" concrete cover under driveways.
- U. Cap all spare conduits.
- V. Provide all empty raceways with a heavy duty nylon cord, full length of raceway. Tag cord for identification.
- W. Maintain safe clearances from hazardous adjacent equipment, hot water piping, flues, high temperature piping, ductwork, etc.

3.2 CONDUIT INSTALLATION SCHEDULE

- A. Concealed in Concrete and Block Walls: Rigid steel conduit. Electrical metallic tubing. Schedule 40 PVC conduit. Electrical Nonmetallic Tubing (ENT).
- B. Within Concrete Slab: Rigid steel conduit. Schedule 40 PVC conduit. Electrical Nonmetallic Tubing (ENT).
- C. Wet Interior Locations: Rigid steel conduit. Schedule 40 PVC conduit.
- D. Concealed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit. Electrical metallic tubing.

- E. Exposed Dry Interior Locations: Rigid steel conduit. Intermediate metal conduit. Electrical metallic tubing.
- F. Motor and equipment connections: Flexible PVC coated metal conduit (all locations). Minimum length shall be one foot (300 mm), maximum length shall be three feet (900 mm). Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
- G. Light fixtures: Direct box or conduit connection for surface mounted and recessed fixtures. Flexible metal conduit from a J-box for recessed lay-in light fixtures. Conduit size shall be 3/8" minimum diameter and six foot (1.8 M) maximum length. Conduit length shall allow movement of fixture for maintenance purposes.
- F. In areas where the walls cannot be fished, the station cable serving these outlets shall be covered with raceways. No exposed wire shall be permitted within offices, laboratories, and conference rooms or like facilities.
- G. The non-metallic raceway shall have a screw applied base. Both the base and cover shall be manufactured of rigid PVC materials.
- H. The raceway shall originate from a surface mounted box mounted adjacent to and at the same height as existing electrical boxes in the room, be attached to the wall and terminate above the ceiling.
- I. All fittings including, but not limited to, extension boxes, elbows, tees, fixture bodies shall match the color of the raceway.
- J. The raceway and all systems devices shall be UL listed and exhibit nonflammable self extinguishing characteristics, tested to specifications of UL94V-0.
- K. The raceway and all systems devices shall adhere to the EIA/TIA Category 5e bend radius standard.

3.3 BOX INSTALLATION

- A. Pull Boxes and Junction Boxes: Locate pull boxes and junction boxes above removable ceilings or in electrical rooms, utility rooms or storage areas.
- B. Outlet Boxes:
 1. Mount outlet boxes flush in area other than mechanical rooms, electrical rooms and above removable ceilings.
 2. Adjust position of outlets in finished masonry walls to suit masonry course lines.
 3. Do not install boxes back-to-back in same wall.
 4. Masonry Walls:
 - a. Coordinate cutting of masonry walls to achieve neat openings for boxes.
 - b. Locate boxes in masonry walls so that only corner need be cut from masonry walls.
 5. Do not use sectional or handy boxes unless specifically requested.
 6. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes.
 7. For outlets mounted above counters, benches or splashbacks, coordinate locations and mounting heights with built-in units.
 8. Adjust outlet mounting height to agree with required location for equipment served.
- C. Boxes supplied by others: Verify exact mounting location and type of mounting.
- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Support all boxes independently of conduit.

3.4 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
 - 1. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
 - 2. No outlet, junction, or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
 - 3. Boxes shall not be fastened to the metal roof deck.

- B. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.
 - 1. In case of any question or argument over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.
 - 2. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

- C. Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 12 inch by 12 inch access doors.

- D. Locate and install to maintain headroom and to present a neat appearance.

- E. Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.

3.5 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings, in unfinished areas or furnish and install approved access panels in non-accessible ceilings where boxes are installed. All boxes are to be readily-accessible.

- B. Support pull and junction boxes independent of conduit.

END OF SECTION

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SECTION 26 12 00 - LOW VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Provide all wires and cables required for a complete electrical system.

1.2 RELATED WORK

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

B. Specified Elsewhere:

- 1. 26 11 00 Raceways and Boxes

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

- 1. National Electrical Code, NEC: Comply with NEC/NFPA No. 70, as applicable to construction and installation of electrical cable, wire and connectors.
- 2. Underwriter Laboratories, UL: Electrical cable, wire and connectors listed and labeled by UL.

- B. References: National Electrical Manufacturers Association/Insulated Power Cable Engineer's Association, NEMA/IPCEA.

1.4 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.
- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable on wood reels, where applicable; and weather-resistant fiberboard containers for factory-packaging of cable, wire and connections to protect against physical damage in transit.
- B. Store cable, wire and connectors in factory-installed coverings in clean, dry indoor space which provides protection against weather.
- C. Do not install damaged cable, wire and connectors; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Wire and Cable:

- 1. Anaconda Wire and Cable Company.

2. Collyer Insulated Wire Company, Division.
3. Electrical Cable Division.
4. General Cable Corporation.
5. General Electric Company.
6. Phelps Dodge Cable and Wire Company.

B. Connectors:

1. AMP, Inc.
2. Burndy Corporation.
3. General Electric Company.
4. Ideal Industries, Inc.
5. 3M Company.
6. O.Z./Gedney Company.
7. Thomas and Betts Company.
8. Buchanon.

2.2 MATERIALS

A. Wire and Cable:

1. 98% conductivity copper.
2. 600 volt insulation.
3. Branch circuit wiring #10 and smaller shall be solid or stranded THWN or THHN. Sizes #8 and larger stranded type THWN or THHN. Stranded wire shall be used for all motor connections regardless of size. Lighting fixture wiring shall be 90 deg C THHN.
4. Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods.
5. Conductors smaller than No. 12 AWG gauge not permitted except for alarm and signal circuits which may be #14 AWG minimum.
6. Color code and identify all wiring as specified in Section 16050.

B. Insulation: Type THHN/THWN, XHHW-2 insulation for feeders and branch circuits. Type XHHW-2 insulation for feeders with aluminum conductors.

C. Exterior Wiring: Comply with NEC for wet location wiring.

D. Wiring for systems other than power:

1. Conform to system manufacturer standards as to size, type and coding, subject to specified minimums.
2. Size conduit as required by system manufacturer, but no smaller than shown.
3. Provide copper XHHW for exterior services.

E. Armored Cable (AC) or Metal-Clad Cable (MC):

1. Limit AC and MC usage to concealed only locations, branch-circuit wiring after the first junction box from the panelboards; where approved by NEC, state and local electrical inspecting authorities.
2. Not allowed for Panelboard feeders or service conduit.
3. Provide and install per NEC Articles 333 and 334 with grounding conductor.

2.3 WIRING CONNECTORS

- A. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.
- B. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers or copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.

- C. All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.
- D. Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.
- E. Split Bolt Connectors: Not acceptable.
- F. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps.
- G. Splices: Splices and taps for No. 10 or smaller shall be with twist-on insulated connectors. Splices in wire No. 8 and larger shall be made with split-bolt or compression connectors equal to Burndy Hydent requiring a tool and die application. Tape all non-insulated compression connectors to achieve full 600V insulation.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. All wire and cable shall be installed in conduit, unless specified
- B. Do not use wire smaller than 12 AWG for power and lighting circuits.
- C. Conductors size indicated on drawings indicates ampacity requirements using copper conductors and type THHN insulation unless otherwise noted.
 - 1. Provide XHHW for exterior services.
- D. All conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity. As a minimum use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 100 feet (30 m), and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet (61 m).

3.2 INSTALLATION

- A. Make conductor length for parallel feeders identical.
- B. Lace or clip groups of feeder conductors at new panel board.
- C. Install wire and cable in NEC Code conforming raceway.
- D. Pulling:
 - 1. Use wire pulling lubricant for pulling No. 4 AWG and larger wire. Use special care to avoid overstraining of conductors.
 - 2. Pull conductors together where more than one is being installed in raceway.
 - 3. Do not use pulling means, including fish tape, cable or rope which can damage raceway.
 - 4. All raceways shall be thoroughly swabbed out with a dry swab to remove moisture and debris before conductors are drawn into place. All ends of raceways shall be tightly plugged with tapered plugs or capped bushings until the conduits are pulled to prevent water and debris from entering conduits. All conduits stubbed up through floors shall be capped and aligned during construction by the use of spacers and caps.
- E. Install wire in conduit runs after concrete and masonry work is complete, conduit shall be clean and dry.
- F. Splicing:

1. Splice only in accessible junction boxes.
2. Install splices and taps which have equivalent or better mechanical strength and insulation as conductor.
3. Use splice and tap connectors which are compatible with conductor material.
4. No. 10 and smaller joints: Utilize connectors as hereinfore specified with PVC or nylon covers.
5. No. 8 and larger joints: Clean and join with tool and die compression type fitting.

3.3 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.
- D. Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway. If parallel phase and/or neutral wires are used, then place an equal number of phase and neutral conductors in same raceway or cable.

3.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Wire splices and taps shall be made firm, and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.
- C. Use solderless spring type pressure connectors with insulating covers for wire splices and taps, 10 AWG and smaller.
- D. Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- E. Thoroughly clean wires before installing lugs and connectors.
- F. At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

END OF SECTION

SECTION 26 14 00 - WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Furnish and install all devices such as switches, receptacles, plates, etc., as shown on the drawings.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 26 11 00 Raceways and Boxes
 - 2. 26 18 50 Equipment Connections
 - 3. 26 45 00 Grounding and Bonding

1.3 SUBMITTALS

- A. Submit products and technical data per Division 1 and Section 26 0500.
- B. Wiring Device and plate color to be selected by Architect.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: Heavy duty use toggle switch, rated 20 amperes and 120/277 volts AC. Switches shall be UL20 Listed and meet Federal Specification WS-896. All switches shall be heavy duty Specification Grade with separate green ground screw.
- B. All switches shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG. Switches shall be Leviton model 1221-S, Hubbell model CS1221, Pass & Seymour model CSB20, Cooper model CSB120, or approved equal.
- C. Handle: made of nylon or high impact resistant material.
- D. Dimming Switches: Combination slider with toggle switch at bottom and LED indicator light. Dimmer switch shall be compatible with the type of LED lighting system under control as recommended by light fixture/driver manufacturer.
 - 1. 0-10 VDC Dimmer: Synergy ISD BC 120/277 IV(ivory) or approved equal.
 - 2. Electronic Low-voltage Dimmer: Synergy ISD 400 ELV 120 IV(ivory) or approved equal.

2.2 RECEPTACLES

- A. Convenience and Straight-blade Receptacles: NEMA Type 5-15R or 5-20R, nylon impact resistant face. Receptacles shall be UL498 Listed and meet Federal Specification WC-596.
- B. All duplex receptacles shall be heavy duty Specification Grade, 15 or 20-amp rated, as scheduled or shown on drawings. All receptacles shall be back and side wired, screw clamp

type, suitable for solid or stranded wire up to #10 AWG, with a separate green ground screw. Receptacles shall be Leviton model 5362-S, Hubbell model CR5362, Pass & Seymour model CRB5362, Pass & Seymour model PT5362 with 90° connector, Cooper model 5362C, or approved equal.

1. Provide tamperproof receptacles where required by local code.
- C. Generally, all receptacles shall be duplex convenience type unless otherwise noted.
 - D. Receptacles installed in damp or wet locations shall be UL listed weather resistant.
 - E. All receptacles installed in outdoor locations, in garages, within 6 feet of the outside edge of sinks, and in other damp or wet locations shall be GFCI type.
 - F. GFCI Receptacles: Duplex convenience receptacle, Specification Grade, with integral ground fault current interrupter meeting the requirements of UL standard 943 Class A and UL standard 498. GFCI receptacles shall be Leviton model 8899, Hubbell model GRF5352, Pass & Seymour model 2095 or approved equal.
 - G. All receptacles on emergency circuits shall have a red face.
 - H. All receptacles designated as isolated ground shall have an isolated ground triangle imprint on the face of the receptacle.
 - I. Locking-Blade Receptacles: As indicated on drawings.

2.3 DEVICE PLATES AND BOX COVERS

- A. Receptacle Cover Plate: Specification Grade 302/304 smooth stainless steel or nylon construction.
 1. Plate color to be selected by Architect.
- B. Weatherproof Cover Plate: Gasketed metal with hinged device covers.
- C. Surface Cover Plate: Raised galvanized steel.
- D. Receptacles installed in damp or wet locations shall be UL listed weather resistant.
 1. Provide as required for each outlet, single or multiple gang.
 2. Provide blank covers on all empty boxes or outlets.
 3. Galvanized steel box covers shall be used in unfinished areas. Cover shall be 1/2" raised with no sharp edges.
 4. Provide single gang, die-cast, weather-resistant covers equal to Leviton #6196-V on receptacles in damp areas and exterior for in-use per NEC.
- E. Any device switches or receptacles necessary for completion of the work, but not called for in the Contract Documents shall be furnished and installed by the Contractor as needed at no additional cost to the Owner. Such devices shall meet the intended standards described in this Section.

PART 3 - EXECUTION

3.1 GENERAL

- A. Receptacles above counters shall be mounted vertically 6" above counter or high enough to miss backsplash if provided.

- B. Receptacles required for equipment shall be located within 2 feet of that equipment if possible.
 - 1. Receptacles for refrigerators, freezers and vending machines shall be mounted at 36" AFF.
 - 2. Verify final mounting height required for electric water cooler with Plumbing Contractor.
- C. Verify all device locations with General Contractor before rough in.

3.2 WIRING DEVICE INSTALLATION

- A. Install wall switches 48 inches above floor, OFF position down.
- B. Install convenience receptacles 18 inches above floor, grounding pole on bottom.
- C. Install box for information outlet 18 inches above finished floor. Install box for telephone jack for wall telephone 54 inches above finished floor.
- D. Install specific-use receptacles at heights shown on Contract Drawings.
- E. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.
- F. Install device plates on switch, receptacle, and blank outlets in finished areas.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- H. Install devices and wall plates flush and level.
- I. Receptacles shall have a bonding conductor from grounding terminal to the metal conduit system. Self-grounding receptacles using mounting screws as bonding means are not approved.

END OF SECTION

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SECTION 26 16 20 - PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Branch Circuit Panelboards.

1.2 RELATED DOCUMENTS

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

- B. Specified Elsewhere:

- 1. 26 05 00 Electrical General Provisions
- 2. 26 45 00 Grounding and Bonding

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:

- 1. National Electrical Code, NEC: Comply with NEC/NFPA No. 70/ANSI C1, as applicable to installation of cabinets, cutout boxes and panelboards.
- 2. Underwriters Laboratories, UL:
 - a. Comply with specified UL publications pertaining to panelboards, enclosures and panelboard accessories.
 - b. Units listed and labeled by UL.

1.4 REFERENCES

- A. National Electrical Manufacturers Association, NEMA:

- 1. PB.1: Panelboards.
- 2. PB.1.1: Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.5 SUBMITTALS

- A. Submit in accordance with Division 1 and Section 16050.

- B. Shop Drawings: Submit dimensioned drawings of installed panelboards and enclosures.

- 1. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store panelboards and enclosure indoors. Protect from weather.

- B. When necessary to store outdoors, elevate well above grade and enclose with durable waterproof wrapping.

- C. Handle panelboards and enclosures carefully to prevent breakage, denting and scarring of finish.

1.7 SPARE PARTS

- A. Keys: Furnish 2 keys for each panelboard to Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Panelboards shall be constructed in accordance with latest NEMA, UL and NEC requirements and shall bear UL label.
- B. Panelboard cabinets including boxes and fronts, shall be code gauge galvanized steel. Panel cover shall be finished in manufacturer's standard color. Main lugs shall be top or bottom mounted to coordinate with incoming feeder entrance location.
- C. Provide isolated ground bus, where indicated, in addition to normal ground bus. Label isolated ground bus appropriately.
- D. All panelboards shall be from one manufacturer.

2.2 ACCEPTABLE MANUFACTURERS

- A. Panelboards:
 - 1. Square D Company.
 - 2. Cutler-Hammer.

2.3 PANELBOARD RATINGS

- A. UL listed short circuit rating (integral equipment rating):
 - 1. 208Y/120V Branch Circuit Panels: 10,000 RMS symmetrical amperes minimum or as indicated on panel schedule equivalent to Square D Type NQOD.

2.4 BRANCH CIRCUIT PANELBOARDS

- A. Lighting and Appliance Branch Circuit Panelboards: Circuit breaker type.
- B. Enclosure: Type 1. Minimum cabinet size: 5-3/4 inches deep; 20 inches wide with 5" minimum gutter space top and bottom. Constructed of galvanized code gauge steel. Panel enclosure (back box) shall be of non-stamped type (without KO's) to avoid concentric break out problem.
- C. Cabinet front cover and cabinet shall be Type 4X, 304 stainless steel in wet and damp locations including kitchen, food service and therapeutic/pool applications.
- D. Provide flush and surface cabinet fronts as scheduled with concealed trim clamps, concealed hinge and flush cylinder lock all keyed alike. Front cover shall be hinged to allow access to wiring gutters without removal of panel trim. Hinged trim shall be held in place with screw fasteners. Finish in manufacturer's standard gray enamel.
- E. Provide metal directory holders with clear plastic covers.
- F. Provide panelboards with copper bus (phase buses, bus fingers, etc.), ratings as scheduled on Drawings.
 - 1. Provide ground bars in all panelboards. Phase, neutral and ground bar terminations can be dual rated ALCU9.
 - 2. Incoming conductors shall terminate at lug landing pads rated for the panelboard.
 - 3. Provide compression type lugs to accommodate the conductor shown on drawings.
- G. Minimum System (i.e. individual component) Short Circuit Rating: As shown on the Drawings and as required by short circuit/ coordination study provided by the Electrical Contractor.

- H. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip circuit breakers. Provide UL Class A ground fault interrupter circuit breakers where shown on Drawings. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
 - 1. Do not use tandem circuit breakers.
 - 2. Circuit breakers shall be bolt-on type with common trip handle for all poles. No handle ties of any sort will be approved.
- I. All of the panelboards provided under this section shall be by the same manufacturer.
- J. All sub-feed panelboards installed side by side shall utilize same enclosure height.

PART 3 - EXECUTION

3.1 GENERAL

- A. Refer to NEMA PB.1.
- B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.
- C. Provide mounting brackets, busbar drillings and filler pieces for unused spaces.
- D. Anchor enclosures firmly to walls and structural surfaces, insuring that they are permanently and mechanically secure.
- E. Provide electrical connections within enclosures.
- F. Prepare and affix typewritten directory to inside cover of panelboard indicating loads controlled by each circuit.
- G. Install panelboards so that no cracks or gaps exist between breakers, breaker cover, panelboard cover and wall (where flush).
- H. All wires shall be neatly installed inside the panelboard box.
- I. Unused spaces shall be filled with metal filler designed for the purpose by the manufacturer.
- J. Stub four(4) empty 3/4" conduits into accessible ceiling space for future wiring requirements.

3.2 INSPECTION

- A. Examine area to receive panelboard to assure adequate clearance for panelboard installation.
- B. Start work only after unsatisfactory conditions are corrected.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.
- B. Flush mount, surface mount, as specified on drawings and schedules.
- C. Support panel cabinets independently to structure with no weight bearing on conduits.
- D. Install recessed panelboards to allow cover to be drawn tight against wall to provide neat appearance.
- E. Install panelboards so top breaker is not higher than 6 ft.-7 in. above floor.

- F. Adjacent panel cabinets shall be of same size and mounted in horizontal alignment.
- G. Install in each panelboard a typewritten directory accurately indicating rooms and/or equipment being served.
- H. Attach nameplates. Nameplates for panels in public areas shall be attached to the inside face of the cover. Nameplates for panels in equipment rooms and other non- public areas shall be attached to the outside face of the cover.
- I. EC shall coordinate depth of recess-mounted panels with G.C. and wall construction to ensure panel is fully contained within wall cavity.
- J. Recess-mounted panels shall be provided with three 3/4" conduits stubbed into adjacent ceiling space for future circuits.

3.4 FIELD QUALITY CONTROL

- A. Balance load among feeder conductors.
- B. Unbalance shall not exceed + 7-1/2% of computed average load per phase.
- C. Energize each circuit and check for complete and correct function.

3.5 ADJUSTMENT AND CLEANING

- A. Adjust doors and operating mechanisms for free mechanical movement.
- B. Tighten lugs and bus connections.
- C. Clean interior of panelboard.
- D. Sand, prime and paint scratched or marred surfaces to match original finish. If other than factory standard color is indicated on Architectural plans, G.C. shall be responsible for painting panel enclosure and/or cover.
- E. EC shall install temporary panel covers as necessary during construction to reduce the construction debris within panels.

END OF SECTION

SECTION 26 19 00 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Conduit and equipment supports.

1.2 RELATED DOCUMENTS

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

- B. Specified Elsewhere:

- 1. 26 11 00 Raceways and Boxes

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:

- 1. National Electrical Code, NEC: Comply with NEC/NFPA No. 70, as applicable to supports.
 - 2. Underwriters Laboratories, UL: Supports listed and labeled by UL.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Support Channel: Steel, Galvanized, Enameled or other corrosion resistant.
- B. Hardware: Corrosion resistant.
- C. Minimum sized threaded rod for supports shall be 3/8" for trapezes and single conduits 1-1/4" and larger, and 1/4" for single conduits 1" and smaller.
- D. Conduit clamps, straps, supports, etc., shall be steel or malleable iron. One-hole straps shall be heavy duty type. All straps shall have steel or malleable backing plates when rigid steel conduit is installed on the interior or exterior surface of any exterior building wall.

2.2 CONDUIT SUPPORTS

- A. Material:

- 1. Single Runs:
 - a. Galvanized two-hole conduit straps or ring-bolt type hangers with specialty spring clips.
 - b. *Do not use plumber's perforated straps.*
 - 2. Multiple Runs: Conduit rack with 25% spare capacity.
 - 3. Vertical Runs: Channel support with conduit fittings.
 - a. 25-ft intervals.

- B. Anchor Methods:

- 1. Hollow Masonry: Toggle bolts or spike type expansion anchors.
 - 2. Solid Masonry: Lead expansion anchors or preset inserts.
 - 3. Metal Surfaces: Machine screws, bolts or welded studs.
 - 4. Wood Surfaces: Wood screws.
 - 5. Concrete Surfaces: Self-drilling anchors or power driven studs.

C. Light Fixtures:

1. Provide grid troffer clips in accordance with NEC 410-16.

D. Mounting Racks and Supports:

1. Provide rack and supports of galvanized or painted steel channel sections with bolted or welded fittings.
2. Provide exterior treated 3/4" plywood mounting surface with gray paint finish on both sides and edges.

PART 3 - EXECUTION

3.1 GENERAL

- A. Maintain headroom, neat mechanical appearance and to support equipment loads.
- B. Suspend, support from and attach only to the structural elements at intervals required by code, with threaded rod, channels, "stand-off" and other clips and NECA approved devices.
- C. To the fullest extent possible, group several conduits together and run parallel, supporting with rod and channel.

3.2 INSTALLATION

- A. Fasten hanger rods, conduit clamps, outlet, junction and pull boxes to building structure using pre-cast insert system, preset inserts, beam clamps, expansion anchors, or spring steel clips (interior metal stud walls only).
 1. Do not use "stand-off" clips for attachment to walls and partitions.
 2. Install raceways tight to walls.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs and wood screws in wood construction. If nail-in anchors are used, they must be removable type anchors.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit. Do not fasten to suspended ceiling grid system.
- D. Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- E. In wet locations, mechanical rooms and electrical rooms install free-standing electrical equipment on 3.5 inch (89 mm) concrete pads.
- F. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch (25 mm) off wall (7/8" Uni-strut or 3/4" painted, fire-retardant plywood is acceptable).
- G. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- H. Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.

END OF SECTION

SECTION 26 45 00 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide and install materials for a complete grounding system integral with the power distribution in accordance with the National Electrical Code.
- B. Distribution grounding system.
- C. Equipment grounding system.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 26 11 00 Raceways and Boxes
 - 2. 26 12 00 Low Voltage Conductors and Cables

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. ANSI/IEEE 142 (Latest edition) - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - 2. National Electrical Code, NEC: Comply with NEC/NFPA No. 70, as applicable to materials and installation of electrical grounding systems and associated equipment and wiring.
 - 3. Underwriters Laboratories:
 - a. Comply with UL Standards pertaining to electrical grounding and bonding.
 - b. UL 467: Grounding and Bonding Equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials used for grounding conductors shall be as called for in National Electrical Code Article #250-81.
- B. Ground Fittings:
 - 1. OZ Company:
 - a. Type BF
 - b. Type OG
 - c. Type LG
 - d. Type MG

2.2 MECHANICAL CONNECTORS

- A. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lockwashers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.

- B. Split bolt connector types are NOT allowed. Exception: the use of split bolts is acceptable for grounding of wire-basket type cable tray, and for cable shields/straps of medium voltage cable.
- C. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.3 COMPRESSION CONNECTORS

- A. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99% by IACS standards.
- B. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.
- C. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.
- D. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.
- E. Each connector shall be factory filled with an oxide-inhibiting compound.

2.4 WIRE

- A. Material: Stranded copper (aluminum not permitted).
- B. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

PART 3 - EXECUTION

2.1 GENERAL

- A. Install Products in accordance with manufacturer's instructions.
- B. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.
- C. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
- D. Attach grounds permanently before permanent building service is energized.

2.2 LESS THAN 600 VOLT SYSTEM GROUNDING

- A. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
- B. Equipment Grounding Conductor: Provide separate, insulated equipment grounding conductor within each raceway. Terminate each end on suitable lug, bus, enclosure or bushing. Provide a ground wire from each device to the respective enclosure.

3.3 INSTALLATION

- A. Electrical service, electrical equipment enclosures and associated metallic raceway system shall be permanently grounded and bonded together by a grounding electrode conductor as per NEC requirements with a ground clamp to a 1-1/4 inch or larger cold water metallic pipe on street side of water meter and ground rod electrodes.

1. Provide water meter shunt; cable to pipe connections copper cable shunt.

- B. Bond main switches, ground rods, foundation reinforcement rebar and water service entrance together with ground electrodes sized per code.
 - 1. Ground connection surfaces shall be clean.
 - 2. Bond structural steel frame to grounding electrode conductor.
- C. Damp Locations: All convenience outlets, switches, fixtures, boxes and plates in damp locations or outdoors shall be fully grounded by a separate green grounding conductor.
- D. Panelboard Grounding: Install grounding conductor from main service to each panelboard and ground bar as indicated on Drawings:
 - 1. Provide separate circuit grounding conductors to dedicated ground circuits, surge suppression receptacles (computers), and GFI receptacles.
- E. Bonding Jumpers:
 - 1. Maintain ground continuity by separate insulated green ground wire in fixture cords, flexible connections or similar location where raceway system is interrupted.
 - 2. Light Fixtures: Provide separate green wire grounded from fixture housing to nearest conduit system box, where flexible conduit is used.
 - 3. Receptacles: Provide green wire bonding jumper from all new receptacles to metal back box.
- F. Motors: Provide insulated grounding conductor from motor connection to distribution panel grounding bus for all motors.
 - 1. Where motors are connected to conduit systems with flexible conduit section, install greenfield grounding conductor in flexible conduit section.
- G. Equipment Grounding Conductors: Provide separate, insulated grounding conductor within each feeder raceway.
 - 1. Ground cable tray at intervals not exceeding 100 feet.
- H. Device Boxes: Provide new green wire ground from panel ground bar to all new devices located in the raceway systems.
 - 1. Provide dedicated ground wire to GFI and surge suppression receptacles.

END OF SECTION

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SECTION 26 51 00 - INTERIOR BUILDING LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide and install lighting fixtures, supports and accessories for mounting condition encountered.
- B. Lamps.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 26 11 00 Raceways and Boxes
 - 2. 26 12 00 Low Voltage Conductors and Cables
 - 3. 26 51 10 Lighting Control Systems

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Certified Ballasts Manufacturers Association, CBM: Ballast labeled by CBM.
 - 2. National Electrical Code, NEC: Comply with NEC/NFPA No. 70, as applicable to installation and construction of interior lighting fixtures.
 - 3. Life Safety Code: Comply with NFPA 101 as applicable to exit signs.
 - 4. Underwriter's Laboratories, UL:
 - a. Interior lighting fixtures listed and labeled by UL.
 - b. UL 57: Electric lighting fixtures.
- B. Lamps General:
 - 1. All lamps shall be new.
 - 2. Approved Manufacturers:
 - a. Fluorescent: Philips, Osram/Sylvania, General Electric
 - b. Ballast and lamp combinations shall meet Focus On Energy Guidelines.
 - 3. Lamps shall be U.S. Green Building Council (USGBC) Leed certified.

1.4 REFERENCES

- A. Standards:
 - 1. American National Standards Institute, ANSI: Comply with applicable ANSI standards pertaining to lamp materials and lighting ballasts.
- B. Manufacturers:
 - 1. National Electrical Manufacturer's Association, NEMA: Comply with applicable portions of NEMA standards pertaining to lighting equipment.

1.5 SUBMITTALS

- A. Submit in accordance with Division 1 and Section 16050.

1. Shop Drawings: Submit shop drawings for luminaires indicating pertinent physical characteristics and photometric data.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Acceptance: Deliver interior lighting fixtures individually wrapped in factory fabricated fiberboard type containers.
- B. Storage:
 1. Store interior lighting fixtures in clean, dry space.
 2. Store in original cartons and protect from dirt, physical damage, weather and construction traffic.
- C. Handling:
 1. Handle interior lighting fixtures carefully to prevent breakage, denting and scoring fixture finish.
 2. Do not install damaged lighting fixtures.
 3. Replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Refer to fixture schedule. Engineer has final decision on whether submitted fixture is equal.
- B. Other fixture manufacturers who consider their products equal to those specified are required to request approval for bidding as base bid in accord with Instructions to Bidders section.
- C. Approval of products will be considered subject to the following:
 1. Equal manufacturers are required to nominally meet specifications of specified fixtures and lenses in regard to ceiling opening size and shape, housing, and trim/door appearance and construction, general overall appearance, efficiency, thickness, brightness control and lamp hiding characteristics.
 2. Provide equivalent performance to specified fixtures considering application in the environment and intended usage by the Owner.
 3. Manufacturers shall submit complete fixture and lens data for evaluation and shall be prepared to submit sample fixtures and/or lenses. Samples shall be submitted only at the request of the Engineer.

2.2 GENERAL

- A. Subject to compliance with requirements, fixtures that may be incorporated into the work include the products specified in the Lighting Fixture Schedule on the drawings, and the equals listed in the accompanying notes.
- B. The basic catalog number only is indicated in the Lighting Fixture Schedule. The EC shall furnish complete lighting fixtures in quantities, and/or row lengths as shown on the plans, including plaster frames, ends, or caps, couplings, connectors, suspension assemblies, mounting brackets and all auxiliary accessories as required.
- C. Refer to Schedule for description of fixture nomenclature and associated ceiling type and suspension system.

2.3 LUMINAIRES

- A. Housings:
1. Shall be free from burrs, sharp corners and edges.
 2. Shall be steel, unless noted otherwise, formed and supported to prevent warping and sagging.
 3. Provide spring loaded latches for all troffers.
 4. Provide UL approved earthquake clips for all troffers.
 5. Provide locking sockets for fluorescent lamps.
- B. Mounting Accessories:
1. Recessed fixtures:
 - a. Provide trim type and accessories required for installation in ceiling types specified and/or shown on the reflected ceiling plan.
 - b. Fixtures mounted in sloped ceilings shall be provided with sloped ceiling adapters and appropriate trim rings and other accessories as required.
 2. Surface-mounted fixtures:
 - a. Provide ceiling spacers as required for fixtures not labeled as suitable for direct mounting to a low density ceiling.
 3. Suspended fixtures:
 - a. Provide swivel canopy to accommodate any sloped ceilings shown on the plans.
 - b. Provide pendant or cable length required to suspend luminaires at indicated height.
 - c. Swivel hangers in mechanical equipment areas shall be shock- absorbing type.
- C. Finishes:
1. Painted finishes:
 - a. Shall be polyester powder painted enamel finish.
 2. Polished, brushed, other metal finishes:
 - a. Shall be finished with clear coat to inhibit finish deterioration and corrosion.
 3. All finish types and colors shall be verified with the architect prior to ordering.
- D. Louvers, Reflectors, Lenses:
1. All louvers and reflectors shall be semi-specular, low iridescent, clear alzak, unless noted otherwise.
 2. Provide reflector channels to separate all lamp sections.
 3. All acrylic lenses shall be pattern 12 prismatic, overall 0.125" minimum thickness.

2.4 FLUORESCENT BALLASTS

- A. All fluorescent ballasts shall be electronic type, unless noted otherwise, and shall meet the following specs:
1. UL Listed (Class P) sound rating A and CSA certified.
 2. Comply with EMI and RFI limits set by the FCC (CFR 47 part 18) or NEMA and not interfere with normal electrical equipment.
 3. Meet any applicable standards set forth by ANSI.
 4. Be potted or conformal coated in a metallic case and not contain PCBs.
 5. Provide normal rated lamp life as stated by lamp manufacturers (i.e. rated life at 3 hour burn time per start).
- B. All compact fluorescent ballasts shall be electronic type, unless noted otherwise, and shall meet the following specs, in addition to those listed above:
- C. Nominal power factor of .95 or higher.

- D. Operate in rapid start mode and have less than a 1.5 Lamp Current Crest Factor as defined by ANSI in paragraph 3.3.3 of the March 18, 1992, draft of ANSI C82.11-199X. "Specification for High-Frequency Fluorescent Lamp Ballasts."
- E. Total harmonic distortion of less than 10% at 120 or 277 volts.
- F. Ballast factor 0.88 or better or as indicated on drawings. For dimming or step dimming ballast factor shall be 0.88 or better, or as indicated on drawings.
- G. Frequency of operation shall be 20 khz - 50 khz and units shall operate without visible flicker.
- H. Units shall operate at an input voltage of 108 volts to 132 volts (nominal 120 volts) or 249 volts to 305 volts (nominal 277 volts) at an input frequency of 60 hz. Light output shall remain constant for line voltage fluctuation of +/- 5%.
- I. Operating temperature shall not exceed 65 degrees C at any point on the case at a 40 degree C ambient.
- J. Ballasts shall carry a minimum 3 year warranty fully covering replacement parts and labor for the life of the warranty.
- K. Ballasts shall be marked with manufacturer's name, part number, supply voltage, power factor, open circuit voltage, current draw for each lamp type and UL Listing.
- L. Ballasts shall withstand line transients as defined in IEEE 587, Category A. Fluorescent Ballasts-Other than electronic type.
 - 1. Fluorescent ballasts shall be high power factor type. CBM and ETL Certified. Best energy saving type where available. Best sound rating available.
- N. Ballasts meeting the requirements of this specification shall be manufactured by the following companies, and are acceptable: GE, Advance, Universal, Osram Sylvania, or as listed by Focus On Energy.
- O. Cold weather ballast shall be rated for -20°F.
- P. Exit Lights:
 - 1. 6-inch high green or red letters with 3/4-inch stroke directional arrows indicated. Mount as indicated or scheduled.
 - 2. Modify mounting type to meet job conditions.
 - 3. Include LED lamps with voltage rating to match system voltage.
 - 4. Provide emergency battery pack when scheduled on Drawings.

2.5 LAMPS

- A. Fluorescent:
 - 1. Color Temperature: 3,500K unless noted otherwise.
 - 2. Minimum Color Rendering Index (CRI): 90 unless noted otherwise.
 - 3. Non-compact Lamps:
 - a. Lamp Life: Minimum 24,000 hours average based on 3 hours per start when used on program rapid start circuits.
 - b. Lamps shall be 32 watt, T8, minimum 3,100 lumens initial, program rapid start, unless noted otherwise.
 - c. Lamps shall be 28 watt, T5, minimum 2,800 lumens initial, programmed start, unless noted otherwise.

- c. All lamps shall meet EPA TCLP standards for disposal as non-hazardous waste.
- 4. Compact Fluorescent:
 - a. Lamp Life: Minimum 10,000 hours average based on 3 hours per start when used on rapid start circuits.
 - b. Lamps shall be 4-pin type, unless noted otherwise.

2.6 LED LIGHTING

- A. The manufacturer of the LED lighting fixture shall utilize high-brightness LEDs and high-efficiency electronic LED drivers, dimmed or no dimmed as required.
- B. The LED fixture shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the fixture is to be installed.
- C. Light output of the LED system shall be the absolute photometry following IESNA LM-79 and IESNA LM-80 requirements and guidelines.
- D. Minimum power factor of 0.90.
- E. LED lighting fixture shall be mercury-free, lead-free and RoHS compliant.
- F. The LED lighting fixture shall maintain 70% lumen output for a minimum of 50,000 hours.
- G. All components of the LED lighting fixture shall be replaceable.
- H. The LED lighting fixture shall carry a limited 3-year warranty minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. It shall be the Contractor's responsibility to determine mounting requirements and verify ceiling types and to coordinate locations of lighting with other contractors to assure that installation will not interfere with other equipment.
 - 2. Anchor surface mounted fixtures on walls or ceilings in a manner to prevent rotation and light leakage. Do not use plastic, composition or wood type anchors.
 - 3. Provide pendant mounted fixtures with self-aligning stem hangers and rigid steel conduit stems, cut and threaded to fit required length. One stem must serve as wireway.
 - 4. Mount suspended fixtures at heights indicated on the drawings. If height is not indicated, mount as high as possible, but not above lowest point of mechanical equipment.
 - 5. Support all suspended fixtures from structural building components. Unless directed otherwise, do not suspend from other suspended equipment.
 - 6. Support system capable of supporting 300% fixture and lamp weight.
- B. Recessed Luminaires:
 - 1. Install recessed luminaire to permit removal from below for access to outlet or prewired fixture box.
 - 2. Connect recessed luminaire to boxes with flexible conduit and fixture wire.
 - 3. Suspended ceiling with exposed tee bar grid system. Support from ceiling tee bar grid structure and with bolts, screws, rivets or approved ceiling framing member clips.

C. Fluorescent Lay-In:

1. Install with plastic protection over louver.
2. Remove plastic protection after final clean up.
3. Fixtures used for temporary lighting shall have louver removed and safely stored.
4. Any contact with louver shall be made utilizing clean gloves to prevent fingerprints on specular finish.

3.2 LAMP INSTALLATION

- A. Install lamps in accordance with manufacturer's instructions.
- B. All lamps shall be delivered to job in sealed cartons and protected from dust and dirt during storage.
- C. Lamps shall be taken directly from the cartons and installed in the fixture with special care so they do not become dusty or soiled. Any fingerprints on the lamps shall be wiped off before the lamps are energized.
- D. Install specified lamps in each luminaire, emergency lighting unit and exit sign.
- E. Relamp luminaires which have failed at completion of Work.
- F. Lamps shall be furnished and installed by the contractor for all fixtures installed, moved, or otherwise reworked on this project, whether or not this contractor installs, moves, or otherwise reworks the fixture.

3.3 FIELD QUALITY CONTROL

- A. At time of substantial completion, replace lamps in fixtures, which are observed to be noticeably dimmed after Contractor's use and testing as judged by Architect-Engineer.
- B. Prior to final acceptance replace all cracked or broken lenses, dented, scratched or otherwise damaged fixtures at no cost to the Owner.

3.4 ADJUST AND CLEAN

- A. Align luminaires and clean diffusers prior to final acceptance.
- B. Provide lamps, as scheduled, for each luminaire.

3.5 SCHEDULES

- A. Lighting Fixture Schedule on Drawings.

END OF SECTION

SECTION 26 51 10 - LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Furnish all labor, equipment, materials, and performing all operations in connection with the installation of the Lighting Control System as shown on the drawings, as hereinafter specified, and as directed by the Engineer. The intent of this specification is to provide for furnishing, installing, testing and placing in operation, the necessary equipment for switching and control of lighting systems.
- B. Extent of lighting control system work is indicated by drawings and by the requirements of this section. Types of lighting control equipment and wiring specified in this section includes the following:
 - 1. Occupancy sensor controls.
- C. Requirements are indicated elsewhere in these specifications for work including, but not limited to, raceways, electrical boxes and fittings, and routers or other network components required for installation of control equipment, which are not work of this section.

1.2 LIGHTING CONTROL SYSTEM OPERATION

- A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction with the lighting control system.
- B. Factory Startup: It shall be the manufacturer's responsibility to verify all proper adjustments and train owner's personnel to ensure owner's satisfaction with the occupancy system. This service is provided at an additional cost.

1.3 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 26 05 00 Basic Materials and Methods
 - 2. 26 11 00 Raceways and Boxes
 - 3. 26 19 00 Supporting Devices
 - 4. 26 51 00 Interior Building Lighting

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Local and state building codes.
 - 2. All requirements of the local authority having jurisdiction.
 - 3. Underwriter's Laboratories: The system and all components shall be listed by Underwriters Laboratories, Inc. for use in fire protective signaling systems under the following standards as applicable.
- B. Codes and Standards:
 - 1. Network - ANSI 875.1, ARCNET®
 - 2. Protocol - ASHRAE 135 – 1995, BACnet®
 - 3. IEEE Std 2000.1-1998
 - 4. UL 916 Energy Management Equipment

5. California Energy Commission

- C. Independent Testing Laboratory - The control panels shall be tested and listed under the UL 916 Energy Management Equipment standards.
- D. System Checkout and training - A factory trained technician or other factory-authorized personnel shall functionally test the system and verify performance after contractor installation. Factory authorized personnel shall conduct a training session to train the building operations personnel on the set-up, programming, operation and maintenance of the lighting control systems.

1.5 SUBMITTALS

- A. Submit in accordance with Section 23 05 00.
- B. Submit complete documentation showing the type, size, rating, style, catalog number, manufacturer's names, photos and or catalog data sheets for all items to ensure compliance with these specifications.
- C. Prior to fabrication manufacture shall submit the following materials for approval:
 - 1. Manufacturer's published catalog data sheets for all equipment and components of the lighting control system.
 - 2. Shop Drawings - Submit drawings of lighting control system and accessories including, but not necessarily limited to, the central programming system, intelligent relay/dimmer panels, network wiring, switch inputs, analog inputs and modem location. As a minimum, the shop drawings shall include the following:
 - One-line schematic diagram with wire type details
 - Network wiring details
 - Lighting control panel load schedules
 - Input and output wiring details
 - Programming worksheets for system configurations
- D. Submit point list for owner to complete custom label requirements.
- E. All references to manufacturer's or supplier's model numbers and other pertinent information herein is intended to establish minimum standards for performance, function and quality. Equivalent equipment (compatible UL listed) from other manufacturers may be substituted for that specified providing the submittal is performed as specified above.

1.6 DELIVER, STORAGE AND HANDLING

- A. Deliver equipment individually wrapped in factory fabricated fiberboard type containers.
- B. Store equipment in clean, dry space.
- C. Protect from dirt, fumes, water and physical damage.
- D. Do not install damaged equipment, remove from site.

1.7 FIELD PROGRAMMING

- A. The system shall be programmable, configurable and expandable in the field without the need for special tools or PROM programmers and shall not require replacement of memory ICs. All standard control panel keyboard or through the use of the optional CRT-1 keyboard. All programs shall be stored in non-volatile memory.

- B. The programming function shall be entered with a special password that may be selected when the system is installed. The password may be changed in the field to a new value at any time by entering the old password and requesting a password change. In the event that the programmer may enter a password and then lose or forget it, the system shall be designed such that the password may be determined by special procedures available through the system manufacturer.

PART 2 - PRODUCTS

2.1 OCCUPANCY SENSOR CONTROLS

- A. Occupancy Sensors shall be equal to Sensor Switch Watt Stopper, Hubbell/Unenco, Novitas, or approved equal.
 - 1. Line voltage occupancy sensors may be used in lieu of low-voltage sensors where approved by the Engineer for areas with inaccessible power pack locations.
- B. Wall switch sensors shall be capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet.
- C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180° coverage capability.
- D. Wall switch products shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.
- E. Wall switch sensors shall have no leakage current to load, in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.
- F. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.
- G. Where specified, vandal resistant wall switch sensors shall utilize a hard lens with a minimum 1.0mm thickness. Products utilizing a soft lens will not be considered.
- H. Passive infrared sensors shall utilize Pulse Count Processing and Digital Signature Analysis to respond only to those signals caused by human motion.
- I. Passive infrared sensors shall utilize mixed signal ASIC which provides high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line), superior performance, and greater reliability.
- J. Passive infrared sensors shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue build-up.
- K. Where specified, passive infrared and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.
- L. Dual technology sensors shall be corner mounted to avoid detection outside the controlled area when doors are left open.
- M. Dual technology sensors shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall not be considered.
- N. Ultrasonic sensors shall utilize Advanced Signal Processing to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.

- O. Ultrasonic operating frequency shall be crystal controlled at 25 kHz within $\pm 0.005\%$ tolerance, 32 kHz within $\pm 0.002\%$ tolerance, or 40 kHz $\pm 0.002\%$ tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.
- P. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.
- Q. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
- R. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.
- S. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.
- T. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
- U. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.
- V. All sensors shall have UL rated, 94V-0 plastic enclosures.

2.2 OCCUPANCY SENSOR CIRCUIT CONTROL HARDWARE

- A. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Control unit shall provide power to a minimum of two (2) sensors.
- B. Relay Contacts shall have ratings of:
 - 13A - 120 VAC Tungsten
 - 20A - 120 VAC Ballast
 - 20A - 277 VAC Ballast
- C. Control wiring between sensors and controls units shall be Class II , 18-24 AWG, stranded U.L. Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.
- D. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

2.3 WIRE AND CABLE

- A. All low voltage cable and wire shall be supplied and installed in accordance with the National Electrical Code and other provisions of Division 26
- B. Cable and wire selected for each application shall be in strict accordance with the original equipment manufacturers recommendations.
- C. All cables and wires shall be permanently tagged at both ends for ease in maintenance.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION AND DOCUMENTATION

- A. Installation - The control system shall be installed and connected as shown on the plans and as directed by the manufacturer. The contractor shall complete all electrical connections to all control circuits, network terminations, RS-232 connections, sensors and override wiring.
- B. Documentation - The contractor shall provide accurate "as built" drawings to the owner indicating the correct and latest program in each controller. The "as-built drawings" shall clearly indicate the lighting control panel identification, the load controlled by each relay, and the device connected to each input.
- C. Operation and Service Manuals – Provide operation and service manuals for all system components as indicated in the General Provisions.

3.2 PRODUCT SUPPORT AND SERVICE

- A. System Start-up: Provide a factory authorized technician to verify the installation, test the system, and train the owner on proper operation and maintenance of the system. Before requesting start-up services, the installing contractor shall verify that:
 - 1. The control system has been fully installed in accordance with manufacturer's installation instructions.
 - 2. Low voltage wiring for overrides and sensors is completed.
 - 3. Accurate "as-built" load schedules have been prepared for each lighting control panel.
 - 4. Proper notification of the impending start-up has been provided to the owner's representative.
- B. Factory Support: Factory telephone support shall be available at no cost to the owner during the warranty period. Factory assistance shall consist of assistance in solving programming or other application issues pertaining to the control equipment. The factory shall provide a toll-free number for technical support.

3.3 OCCUPANCY SENSOR CONTROL INSTALLATION

- A. It shall be the contractor's responsibility to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.
- B. It is the contractors responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.
- C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

3.3 WARRANTY

- A. Manufacturer shall provide a one (1) year limited warranty on the lighting control system and software. A ten (10) year limited warranty shall be provided on the lighting control relays.

3.4 TESTS AND REPORTS

- A. Final Acceptance: The system will be accepted only after a satisfactory test of the entire system has been accomplished by a factory-trained distributor in the presence of the Owner's Representative.
- B. On-Site Services: Contractor shall provide the on-site services of an authorized technical representative of the manufacturer, to supervise all connections and fully test all devices and components of the system as installed. Owner's representative shall be instructed in the proper use and testing of the system.

3.5 BASIC OPERATOR TRAINING

- A. Installation Contractor and equipment vendor shall provide all training materials, testing equipment, and demonstration aids required to provide operator, supervision, and maintenance personnel training. At completion of the training period, all training brochures, bulletins, manuals, handbooks, and diagnostic guidelines shall remain with the Owner.

END OF SECTION

SECTION 26 51 15 - LIGHTING & CONTROL SYSTEMS INTEGRATOR

Part 1 – General

1.01 Section Includes

- A. Lighting & Controls Integration for Television Studio & Conference Room

1.02 Related Requirements

Section 11 XX XX – Studio Pipe Grid & Drapery

1.03 Quality Assurance

- A. Lighting & Control Systems Integrator Qualifications
 1. Must meet requirements for Dealer membership in PLASA.
 2. The Lighting & Control Systems Integrator (hereafter referred to as LCSI) shall employ technicians, programmers and project managers experienced in completing work of similar size or scope.
 3. The LCSI shall be a lighting systems contractor who regularly engages in the furnishing, installation, commissioning, programming and servicing of systems of a similar nature, size, scope and complexity.
 4. The LCSI shall for 5 years prior to the bid date have maintained a suitably staffed and equipped service organization which has continually supplied service for the systems to be used in this project.
 5. The LCSI shall have on staff at least 2 technicians certified by the manufacturer to provide service on the equipment to be used in this project. LCSI shall provide phone based technical support within 30 minutes during normal business hours, and within 12 hours during evenings, weekends and holidays.
 6. The LCSI shall maintain throughout the course of this project and its warranty period, all required business and professional licenses, certifications and insurance.

1.04 Substitutions

- A. LCSIs who are not preapproved shall submit the following at least 14 days prior to bid date.
 1. Listing of 10 equivalent installations including:
 - a. Name, address & contact information for project owner, lighting consultant and electrical contractor.
 - b. Description of project scope of work including particular manufacturers and products in use.
 2. Brief description of LCSI's operations including facilities, departments and key personnel.
 3. Biographical information of project manager and integration team who would be involved in this project.
 4. A list of any subcontractors the LCSI intends to use including their scope and qualifications to perform that scope.

1.05 Submittals

- A. At Bid Date:
 1. LCSI qualifications including the Project Manager's qualifications.
 2. Bill of materials for all equipment called for in section 2.02 B.
 3. Expectations of time and personnel requirements for the scope of services enumerated in this specification, by service type (i.e. project management meetings, submittal documentation, developing scope of work & content schedule, field quality control, low voltage data terminations, commissioning, programming, owner training, etc.).

- B. Product Data: Submit product data for each LED system that requires system integration. Review the contract documents and identify each LED system and its components including:
1. Luminaires – including data sheets and photometric data in IES file format in accordance to IES LM-79-08. Photometric data shall be based on test results from an independent, NIST traceable testing lab.
 2. Power Supplies and/or Drivers
 3. Controller(s)
 4. Control Interfaces and Signal Amplifiers – Include network switches & routers, opto-isolators, DALI & 0-10V interfaces, DMX Network Gateways
 5. Wire, Cable and Wireless Transmission/Reception Equipment
 6. Mounting Brackets and/or Hardware
 7. Light Control Accessories such as lenses, louvers, etc.
- C. Shop Drawings: Provide coordinated wiring diagrams for each LED system and floor plans and/or elevations indicating location of each device. Device locations shall be indicated in accessible locations coordinated with construction manager.
1. Lighting fixture, power supply, control source & interface.
 2. Identify wire type, size and approximate length on wiring diagrams.
 3. Identify the required power & control terminations.
 4. Coordinate the control addressing scheme with the lighting control system manufacturer and owner's representative.
- D. Fixture Schedules – Generate Schedules for each system including the following information on a per fixture and per circuit basis:
1. DMX (or other control source) addressing
 2. Panel, circuit and unique dimmer identifier (where applicable).
 3. Dimmer module type (where applicable)
 4. Control Zone Information
 5. Fixture Type & Description
 6. Fixture Location
 7. Load
 8. Fixture Serial Number where required for addressing
 9. Performance requirements (dimming curves, color rendering, granularity of fade, etc.)
 10. Aiming Notes
 11. Other Notes (special mounting conditions, special fixture configurations or modes, desired homing positions, etc.)
- E. Control Wiring Schedule – Generate a schedule showing each control wire run including:
1. Wire Number
 2. Wire Type
 3. Control Protocol Carried
 4. End Devices – Where does each end of the wire terminate
 5. Notes – Special Pin-outs, termination types, etc.
- F. Operation & Maintenance Manuals:
1. As built drawings including schematics, details, wiring diagrams & floor plans. All wiring diagrams must include wire identification matching labels in the field.
 2. Bill of materials including indication of spare equipment delivered to the owner.
 3. Any revisions or modifications during the warranty period shall require that the owners' record drawings be updated.

1.06 Warranty

- A. The LCSi shall provide a one year system warranty for the complete system (not including expendable supplies), effective from date of system acceptance. Within this period, the LCSi shall be the owner's sole contact for remedy, repair or replacement of system deficiencies (through manufacturers' warranties where applicable).

Part 2 - PRODUCTS

2.01 Acceptable Lighting Control Systems Integrator

- A. Pursuant to the above requirements, the LCSi shall be:
1. DesignLab Wisconsin – Contact Doug MacDonald. 328 N. Albany Ave. Chicago, IL. 608-287-6031. doug@dlabwi.com

2.02 System Integration Requirements

- A. Provide integration of LED luminaires and controls to comply with the Contract Documents in the following area(s):
1. Television Studio
 2. Conference Room
 3. Control Booths & Network Closet
- B. Provide all non-specified equipment required to ensure a complete, working system. This may include:
1. Signal Processing Equipment Racks & Control Enclosures – Provide racks and/or enclosures required for proper mounting & protection of all lighting control equipment
 2. Networking Equipment – Switches, patch panels, cable managers
 3. UPS devices – Sufficient to keep all control and communications equipment (not including light fixtures or their power supplies) operational through a 10 minute power outage
 4. Signal Interfaces – Opto-Isolators, Demultiplexers, protocol converters
 5. Patch & Jumper Cables – DMX, Network & Power jumpers required for a complete, working system.
- C. Provide data terminations for all lighting system control wire runs (network, DMX, fiberoptic, etc.). Wire to be piped & pulled by electrical contractor to LCSi's specifications.

2.03 Lighting System and Accessories

- A. General
1. The lighting control desk shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems. The device shall be the Ion as manufactured by Electronic Theatre Controls, Inc., or equal.
 2. The system shall provide control of from 1024 to 6144 outputs, in 512 output increments, on a maximum of 16,000 control channels, patched across any number up to 99,999. Output shall be distributed over a 10/100MB Ethernet network using Net3/ACN, ETCNet 2, Avab and/or ArtNet protocols. The user shall be able to control the application of protocols at an individual address level.
 3. The system shall support full bi-directional RDM communication with compatible devices via Net3 DMX/RDM Gateways. RDM communication shall adhere to ANSI standard E1.20-2006 Entertainment Technology – RDM – Remote Device Management Over DMX512 Networks. Supported RDM features shall include:
 - a. Discovery and identification of RDM capable devices
 - b. Setting of start addresses, operating modes and additional settings as exposed by connected devices and controllable via RDM
 - c. Viewing of Sensor data as provided by connected devices.
 - d. Error reported as provided by connected devices.
 4. A maximum of 10,000 cues, 999 cue lists, 1000 groups, 1000 presets, 4 x 1000 palettes (Intensity, Focus, Color and Beam), 1000 effects, 1000 macros, 999 submasters and 100 curves may be contained in non-volatile electronic memory and stored to an onboard hard drive or to any USB storage device.
 5. Recorded cue lists may be played back simultaneously on a maximum of 200 faders. Channels shall respond to cue information by last instruction with

discrete rate control provided for all cues. The desk may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required. HTP/LTP intensity flags, assert, proportional, intensity master or manual master fade control and independent status may be placed on each cue list. It shall also be possible for a cue list to contribute to playback background states or to withhold such contributions.

6. A Master Playback fader pair and dedicated Grand Master/Blackout shall be provided.
7. Up to six USB fader wings may be connected to the desk, for a maximum of 300 loaded submasters and/or 200 playback faders. USB fader wings may be rigidly connected to the main desk to provide a "single connected unit" with no external cables required. The wings also may be connected via USB cables and used "on the side." Virtual fader control is also provided.
8. A high-resolution level wheel shall be provided to control intensity for selected channels and scrolling within selected displays. Four page-able high-resolution encoders shall be provided for control of non-intensity parameters. Non-intensity encoders may be operated in coarse or fine mode, with the amount of movement per revolution of the encoders in coarse mode definable by the user. Non-intensity parameters shall be controllable via the encoders or keypad controls, without need of an external pointing device. A high-resolution rate wheel shall also be provided.
9. Rotary encoders for non-intensity parameters shall be labeled by means of an integral LCD display mounted below the encoders on the main desk. The display shall show the currently loaded functions of the encoders based on the current selections. Systems using encoders with no LCD labeling shall not be acceptable.
10. Virtual moving light controls shall provide mouse/touch-based tools for all parameters. The tools shall display the current value for each parameter and shall provide controls for adjusting each parameter.
11. Control and programming features for automated fixtures shall also include: a standard library of fixture profiles, the ability to copy and edit existing profiles and create new profiles, patch displays including channel and output addressing, 16-bit fade resolution, color characterization allowing color mixing and storing in Hue and Saturation or native device values.
12. System information, including playback status, live output and blind values for all record targets shall be displayed on a maximum of two external high-resolution DVI monitors, or one Display port monitor, which may also be touch or multi-touchscreen(s). Only one display shall be required for operation. Content of all displays and individual workspaces shall be zoomable. Each display shall have 3 definable workspaces; each workspace with split controls allowing sizing of frames. Single monitor snapshots with an on-screen browser shall provide rapid reconfiguration of workspaces.
13. A context sensitive on-line Help feature shall explain and provide an example of the operation of each feature of the system.
14. A fully integrated Virtual Media Server feature shall allow the user to map images and animations to a rig array. 40 such maps may be created, each with 12 layers. Systems that rely on external hardware or software for this functionality shall not be acceptable.
15. User-definable, interactive displays may be created. These displays, which can be used in live and blind operating modes, allow graphical layout of channels, desk buttons and programming tools. Standard symbols are provided, and the user may import his own symbols or graphics. Each symbol may be individually defined with data feedback characteristics. Non-interactive status information, such as a mirror of other user's command lines, may also be included in the display. A graphical browser is provided for fast selection of these views. Multiple zoom factors and placements may be stored and recalled for each display.
16. An optional, full-functioning, detachable alphanumeric keyboard shall be supported. The keyboard shall allow labeling of channels, cues, presets, groups,

- palettes, effects, macros, curves and the show. An integral electronic keyboard shall be provided.
17. A row of softkeys shall be provided, which change function based on the selection and context of the desk. These softkeys shall be labeled via an adjacent LCD display that shows their current functions at all times. Systems using softkeys with no LCD display shall not be acceptable.
 18. Software upgrades shall be made by the user via a USB port; changing internal components shall not be required. It shall be possible to install software updates in all consoles, processor units and remotes from one device over the network.
 19. The operating software shall be loaded into program execution memory from the internal hard drive when the console is powered. In the event of an uncontrolled shutdown, the device shall return to its last output state when power is restored.
 20. Dimmer monitoring and configuration features shall be provided (in conjunction with ETC's Sensor+, Sensor 3 or FDX dimming systems) to allow indication of dimming system status, dimmer load monitoring and show specific configurations.
 21. Show data may be created and modified on a personal computer, using Windows 7/8 operating systems, with a free offline editing application. The offline editor may also run natively on Intel-based Macintosh platforms using OS X. The program shall also allow output to visualization software supporting the same protocols as the lighting system.
 22. A PC using Windows 7/8 or an Intel-based Macintosh computer using OS X running the offline editing software shall be able to connect to a control system via the network and view or modify current show data in an independent display environment, using an Nomad Dongle. When connected without the dongle, the computer shall operate in Mirror Mode, with the device to be mirrored selectable by the user. Systems that do not provide client software that may run natively on the Apple platform in this environment shall not be acceptable.
 23. Synchronized backup shall be provided via another full desk on the network, by use of a remote processor unit or a Nomad 1024/1536/2048. Available output is determined by the lowest output configuration between the primary and the backup. The backup device shall maintain synchronized playback with the primary and shall take over control of the lighting system upon loss of communication with the primary. Use of two RPUs to service and backup system output is also supported. Systems that do not offer this kind of instant backup from multiple sources shall not be acceptable.
 24. A maximum of four users may access and interact with show data simultaneously. Each user shall have an individual workspace and channel partitioning shall be supported. User identification may be assigned to more than one control device, allowing users to work in tandem, or allowing a designer/ALD to mirror the current display format, mode and command line of the associated programmer. Partitioned control allows discrete control of channel/parameter groupings by user. Partitioned control may be easily enabled and disabled with no need to merge show data from multiple users.
 25. Mirror mode shall allow the desk displays and operating modes to be mimicked on another connected device. Alternatively, the desk may mirror another device.
 26. The system shall allow remote control from external devices as follows: Offline software with a dongle running on a PC/Mac connected to the network, a remote video interface with keyboard, and a purpose-built wireless remote focus unit (Radio Focus Remote). Fader wings may be attached to any of these devices for local fader control. Systems without these remote control devices shall not be acceptable.
 27. The system shall support a Telephone remote control that allows basic functions to be controlled from a standard wireless phone producing touch-tone signals. This allows the use of a standard telephone for a low cost remote control. Systems that do not allow this function shall not be acceptable.
 28. Show data may be created and modified on a personal computer, using Windows 7/8 operating systems, with a free offline editing application. The offline editor may also run natively on Intel-based Macintosh platforms using OS

- X. The program shall allow output to visualization software supporting the same protocols as the lighting system.
- 29. The system shall support up to 32 individual Time Code Event lists.

B. Controls and Playback

1. Manual Control and Programming Section

- a. The programming keyboard shall be grouped by function. Major groupings shall be record target functions, numeric keys, level assignment functions, display navigation functions and controls.
- b. Non-intensity parameters may be set numerically or via the encoders. This control shall be fully interactive. In either case the current parameter value shall be displayed on the desk monitor and simultaneously on the integral LCD display. Systems using only a local LCD or only a video monitor shall not be acceptable.
- c. Only those parameters available for control in the active lighting system shall be displayed for control.
- d. Lamp controls provide direct access to luminaire functions such as striking and dousing arc lamps and calibrating entire fixtures or individual mechanisms of fixtures, as provided by the luminaire manufacturer. User access to these features is normalized across all manufacturers for ease of use. Use of a "control channel" for accessing these functions shall not be required and systems requiring use of a control channel shall not be acceptable. Lamp control commands maybe e staged, and channels which have been sent lamp on commands so indicated in live.
- e. Fan functions shall be provided both via command line operation and through encoder controls.
- f. Highlight shall be supported, with user definable highlight values. Lowlight conditions may be defined for selected, but not specified channels. Rem Dim command, at specific levels by channel, may be optionally and automatically called with the highlight command.
- g. Fixtures with CMY or RBG color mixing may be set with direct CMY or RBG controls, as well as the Hue and Saturation encoders and/or color picker. Color may also be set directly to a gel match, via a graphic selection tool or from the command line.
- h. The Virtual Media Server function shall allow the user to create layouts of devices, identified as pixel maps. Media content (images, movies, text and procedurally generated effects) may then be applied, manipulated and stored. Stock content is provided and the user may import custom imagery and animations.
- i. Macros may be set to run as default. Default macros called manually shall post to the command line, but executed via cue lists shall run in the background. The user may override this behavior by defining the macro to always execute in the foreground or the background, regardless of the recall method. Startup, Shutdown and Disconnect macros may also be defined.

2. Playback Section

- a. The master fader shall consist of a 60mm Master Fader pair with associated Load, Go and Stop/Back buttons. Additional playback faders may be configured via the virtual fader module or on the Universal Fader Wings.
- b. It shall be possible to instantaneously halt an active cue, back to the previous cue, manually override the intensity fade or manually override the entire fade.
- c. It shall be possible for a cue list to contribute to the background state or for the contents o each cue list to be withheld from such.
- d. The playback faders shall have the following associate controls:
 - 1) Freeze, which halts the output of the fader.
 - 2) Stop Effect, which stops the action of an effect.

- 3) Filter, to assign filter states to a fader
 - 4) Go to Cue 0, to reset a cue list.
3. Fader Wings (Optional)
 - a. Submaster and fader support shall be provided via optional fader wings. These wings are available in 1x20, 2x10 and 2x20 configurations. Up to six of these wings may be connected to the desk via internal or external USB. Via paging, access is provided to all 300 faders, regardless of the number of physical wings attached.
 - b. The 2x10 and 2x20 fader wings shall include a full length LCD for labeling and identification functions. Each fader shall have two associated hard buttons for various operations. Systems without a local display or fewer than two buttons per fader shall not be acceptable.
 - c. Up to 999 proportional, fully overlapping additive, effect or inhibitive submasters may be defined. Submasters shall have colored LEDs to indicate submaster status. Each submaster may have fade up, dwell and down fade times. Each has a bump and assert/channel select button. Submasters may be set to independent, exclusive, shielded and proportional/intensity or effect master control.
 - d. The submaster blind buffer shall be linked directly to live playback allowing live editing of live submaster content via the command line.
 - e. It shall be possible to set submaster values directly from the command line.
 - f. Up to 200 cue lists may be active concurrently.
 4. Grand Master
 - a. A dedicated grand master and blackout button are provided.
 - b. The grand master shall proportionally fade intensity values to zero. Blackout shall send all intensity outputs to zero. Non-intensity outputs shall not be affected. No additional configuration shall be required to withhold non-intensity values from Grand Master and Blackout control.
- C. Display Controls
1. Format shall change the view of selected displays.
 2. It shall be possible for the user to choose which parameter categories or parameters (s)he wishes to display.
 3. Flexichannel shall change which channels are viewed in selected displays, as follows:
 - a. All channels
 - b. Patched channels
 - c. Show channels
 - d. Active/Moved channels
 - e. Selected channels
 - f. Manual Channels
 - g. View channels (user identified list)
 - h. Channels with discrete timing
 4. Expand shall extend the selected view sequentially across connected displays, vertically or horizontally.
 5. [Time] depressed shall display discrete timing data. [Data] depressed shall display absolute values of referenced data.
 6. User definable magic sheets shall provide alternative display of and access to channels and record targets. Multiple magic sheets may be created.
 7. Playback status displays are provided with a variety of different formats. Indications are provided per cue for live moves (lights fading from zero and also moving non-intensity parameters) and dark moves (inactive lights which have stored non-intensity parameter moves).
 8. Each display may have three individually configured workspaces. Each workspace supports discrete frame controls allowing user defined displays, sized as per user requirements.

D. Operating Modes

1. Live Mode

- a. Channel lists may be constructed using the +, - and Thru keys as well as the direct selects. Channel selection and deselection is fully interactive, regardless of the method used.
- b. Levels may be set with the keypad, level wheel and non-intensity encoders. "Selected" channels shall be those last addressed and under keypad control.
- c. Sneak shall be used to restore specified channels to background states, default values, or to send them to specified values, in user specified or default times.
- d. Selected channels may be set at a level or held to current values while all other channels are set to zero using Rem Dim. Toggling Rem Dim shall restore all unselected channels to original levels. The Rem Dim level shall be user definable via the command line or with a default setup value.
- e. Channels may be recorded into groups for fast recall of commonly used channels. 1000 groups shall be available. Groups shall store selection order. The Offset function supports rapid creation of ordered groups, including reverse and random order.
- f. Parameter settings may be stored to Intensity, Focus, Color and Beam Palettes and to Presets. All referenced data may be stored to whole numbers or to up to 99 decimal places between each whole number. It shall be possible to store 1000 presets and 1000 of each palette type.
- g. Any collection of channel data, as determined by the use of "Record", "Record Only, selective store commands and/or parameter filters may be stored to palettes (as appropriate to the type) and presets.
- h. The following conditions may be placed on a channel or channel parameter to be included with a cue record action.
 - 1) Discrete fade time and/or delay
 - 2) Block flag
 - 3) Assert flag
 - 4) IFCB Filters, which may be set at a parameter level.
- i. 999 cue lists may be stored. Cues may be recorded in any order. Up to 99 decimal cues may be inserted between any two whole number cues. Each cue may contain a maximum of twenty parts. Parameters may be automatically assigned to specific parts or assigned when the part is created.
- j. It shall be possible to record cues and cue parts with the following information:
 - 1) Any collection of channel data, as determined by the use of "Record", "Record Only" or selective store commands, combined with parameter filters.
 - 2) Cue Level timing and delays for Intensity Up, Intensity Down, Focus, Color and Beam.
 - 3) Follow or hang time
 - 4) Link instruction
 - 5) Loop value
 - 6) Block, Assert, Allfade, Preheat and/or Mark Flag
 - 7) Curve
 - 8) Label and note
 - 9) Execute list to trigger other activity
- k. Non-intensity channel parameters may be marked (preset), in two ways. Automark presets any parameters transitions in the cue just prior to intensity becoming active. Automark may be disabled on a cue or cue part basis, enabling a "live" move. Alternatively, non-

- intensity parameters may be marked to a specific cue with a single command instruction. It shall not be necessary to store these parameters directly into the cue in which the movement is to occur.
- l. Any channel parameter may be stored with an effect instruction. These effects may contain relative offsets from current value, or absolute instructions. Effects may be progressive action or on/off states. Entry and exit behaviors shall modify the channel parameters activity when beginning and ending the effect.
 - m. Update may be used to selectively add modified parameter data quickly to that parameter's current source. It shall be possible to update inactive record targets. It shall also be possible to update back to the current source of the move instruction without specifying that cue via Trace. A context sensitive display provides detailed information regarding the results of the update command.
 - n. Recall From quickly pulls specified data from record targets or other channels into the current view. Recall from on an HTP basis shall be provided.
 - o. Copy To quickly copies selected data to specified channels or other record targets.
 - p. Address and channel check functions shall be provided.
 - q. Channel parameters may be "parked" at levels. Output addresses may also be parted directly. Parked levels shall not be added to any live record operations, nor may they be changed until the parked element is "unparked". Address Park shall also be provided.
 - r. About shall provide detailed status of selected channels or specified record targets. This shall include current source, current value, discrete timing, parked value, marked to and for indications. Background levels and current DMX output are also displayed. Channel usage indicates submaster and cue information and also provides a "dark moves" report on a per channel basis.
 - s. 1000 snapshots may be stored which instantly recall specified front panel and display configurations.
 - t. Live data may be displayed in a summary view, detailed table orientation or a user-defined magic sheet.
 - u. Undo shall be used to sequentially step back through manual operations, record, update and delete actions. Redo functions shall be provided. Multiple undo commands may be executed at once.
 - v. Home shall set selected channels non-intensity parameters to their default values. User definable home, on a per channel/per parameter basis shall be provided.
 - w. Move shall allow all show data to be moved from one record target to another.
 - x. Query shall allow selection of channels by their current or possible state. Keywords and fixture types shall allow quick access to fixtures.
2. Blind
 - a. The Blind display allows viewing and modification of all record targets without affecting stage levels.
 - b. Record target data may be displayed in a summary view, a detailed table orientation or a spreadsheet view, which allows quick data comparisons, move and replace with functions.
 - c. Changes made in blind displays shall be automatically stored.
 - d. Blind editing shall be possible for all record targets.
 - e. Selection of what parameter data to view for blind editing shall be user configurable.
 3. Patch Display
 - a. Patch shall be used to display and modify the system control channels with their associated library data.

- b. Each channel may be provided with a proportional patch level, preheat, curve, label, swap and invert functions.
 - c. Offset functions in patch shall allow selection of channel ranges and shall allow the user to establish a "custom" footprint for any device output.
 - d. A full library of profiles is provided, with the ability for the user to define "favorites" for fast selection.
 - e. Custom color wheels, color scrolls and gobo wheels shall be defined in patch. These devices shall be created with a simple table and graphical user interface supported by images of major manufacturers.
 - f. Copy to and Move functions shall be supported in patch.
 - g. RDM discovery and device monitoring shall be supported.
4. Setup/Browser
- a. Setup shall access system, show and desk configurations.
 - b. The browser shall access show data storage, import, export, print to .pdf and clear functions, as well as show data utilities.
 - c. It shall be possible to partially merge show files. Users shall be able to select as much or as little of the show file as required, with renumber tools.
 - d. It shall be possible to import ASCII and Lightwright data files. It shall be possible to export as ASCII or .csv.
 - e. The system shall support programming and playback of real time clock events, including cue, submaster and macro execution at specific times of specified days or at a time based on astronomical events.
 - f. A control screen shall be provided for network configuration, selecting date/time, software update controls, selecting functional language and/or keyboard for labeling option, as well as other system level tools.
 - g. Available languages for prompts, advisories and help messages shall include English, Bulgarian, German, Spanish, French, Italian, Japanese, Korean, Russian, Chinese, simplified and Chinese, traditional.
 - h. Supported keyboards shall include American, United Kingdom, French, German, Italian, Korean, Norwegian, Russian, Slovakian, Turkish, Swiss, Swedish, Finnish and Bulgarian

E. Dimmer Monitoring and Configuration

- 1. The lighting control system shall provide communication with an ETC Sensor+, Sensor3 or FDX dimming system for remote monitoring and configuration of show specific functions from within the software application.
- 2. Circuit level configuration and monitoring functions shall include but not be limited to:
 - a. Control mode (dimnable, switched, latch-lock, always on, off or fluorescent).
 - b. Curves
 - c. Control threshold
 - d. Min and Max Scale Voltage
 - e. Preheat
 - f. Scale load
- 3. Rack Status messages shall include but not be limited to:
 - a. State of UL924 panic closure
 - b. DMX port error/failure
 - c. Network error/failure
 - d. A, B, C Phase below 90 or above 139 volts and headroom warning
 - e. Ambient temperatures out of range
- 4. Circuit status shall include but not be limited to:
 - a. Module type and location

- b. Output level
 - c. Control Source
 - d. Overtemp
5. Advanced circuit feedback shall include but not be limited to:
- a. Load higher or lower than recorded value
 - b. DC detected on output
 - c. SCR failed on/off
 - d. Breaker trip
 - e. Module has been removed
 - f. Load failure
 - g. Shutdown due to overtemp

F. Training Options

1. Training packages shall be available customizable to the individual venue preferences and needs. The level of training (beginner, intermediate or advanced) may be selected and training may be defined as an element of system commissioning or deferred to a later time.

G. Interface Options

1. The unit shall support a variety of local interfaces.
- a. AC input.
 - b. USB (seven ports for connecting devices such as an alphanumeric keyboard, mouse, touch screens, USB Flash drive, fader wings, etc.)
The desk shall provide at least one USB port on the face panel itself.
 - c. Ethernet (two individually configurable ports)
 - d. Two DVI video output connectors, supporting a maximum of two DVI monitors at 1280x1024 resolution minimum, touchscreen and multi-touch controls optional.
 - e. One Display Port connector
 - f. Two DMX512-A/RDM Ports
 - g. Contact Closure Trigger Via D-Sub Connector
 - h. Phone Remote
 - i. MIDI In/Out (MIDI Timecode, MIDI Show Control)
 - j. OSC and UPD Strings
 - k. XLR 3-Pin Female (Littlite)
 - l. One eSATA port

H. Accessories - Control Console shall support:

- 1. Net3 Radio Focus Remote
- 2. iRFR and iRFR Preview (application for iPhone, iPod Touch and iPad units)
- 3. aRFR (application for Android devices)
- 4. Net3 Remote Video Interface
- 5. Up to six fader wings may be attached to the main console via internal or external USB connections. Systems that do not allow the addition of fader wings shall not be acceptable.
- 6. Net 3Gateways
 - a. Net3/ETCNet 2 to DMX/RDM Gateways (one to four ports)
 - b. MIDI/SMPTE Gateways
 - c. I/O Gateway with 12 analog inputs, 12 SPDT contact outputs, RD232 interface
- 7. Nomad Software (Mirror Mode)
- 8. Nomad 1024/1536/2048 Kit (backup)

I. Synchronized Backup

1. An optional Backup system shall consist of one of the following combinations of devices:
- a. Two networked desks
 - b. One (or more) desk with one Remote Processor Unit (RPU)

- c. One (or more) desk with two Remote Processor Units (RPUs)
- d. One (or more) desks/RPUs with Nomad

J. Physical and Acoustical

- 1. All operator controls and electronics for a standard system shall be housed in a single desktop console, not to exceed 19" wide, 19" deep, 5.5" high, weighing 20 pounds.
- 2. Power shall be 95 – 240V AC at 50 or 60Hz, supplied via a detachable power cord.
- 3. At typical CPU utilization, the unit shall operate at ≤ 26 dBA.

2.04 UNIVERSAL FADER WINGS

A. General

- 1. The universal fader wings shall provide extended playback control for the lighting control system.
- 2. The universal fader wings shall be compatible with the ETC Eos, Ion, Congo and Congo jr lighting control systems and their associated devices.
- 3. The universal fader wings shall be available in three configurations:
 - a. The 2x20 fader wing shall have 40 45mm faders, 80 keys with LEDs and integral LCD display.
 - b. The 2x10 fader wing shall have 20 45mm faders, 40 keys with LEDs and integral LCD display.
 - c. The 1x20 fader shall have 20 45mm faders and 40 keys with LEDs.

B. Mechanical and Electrical

- 1. The 2x20 and 2x10 fader wings shall connect to Ion and Congo jr rigidly or via external USB cables. When connected rigidly, power and data shall be provided internally. When data is connected via external USB, power is also provided externally.
- 2. The 2x20 and 2x10 fader wings shall connect to Eos, the Eos or Ion Remote Processor Unit, the Net3 Remote Video Interface, Congo console, Congo Light Server and PCs operating the Eos, Ion or Congo Client software via external USB cable. In this configuration, power is also provided externally.
- 3. The 1x20 fader wing shall mount rigidly to the top rail of Ion or Congo jr consoles, with power and data provided externally.
- 4. The 2x20 fader wing shall be 17.89" (454mm) wide, 5.25" (133mm) high and 15.93" (405mm) deep, weighing 12 pounds (5.5 kgs).
- 5. The 2x10 fader wing shall be 9.45" (240mm) wide, 5.25" (133mm) high and 15.93" (405mm) deep, weighing 6.5 pounds (2.95 kgs).
- 6. The 1x20 fader wing shall be 17.88" (434mm) wide, 7.31" (185) high and 1.32" (33.53mm) deep, weight 5.67 pounds (2.57 Kg) .

2.05 WALL MOUNT RELAY PANEL

A. General

- 1. The wall mount relay panel shall be the Unison Echo Relay Panel as manufactured by Electronic Theatre Controls, Inc., or equal. Unison Echo Relay Panels shall be UL508, UL67, and UL924 Listed, and shall be so labeled when delivered.
- 2. The Unison Echo Relay Panel shall consist of a main enclosure with 30 pole breaker subpanel, Relay sub panel, integral control electronics, and a low voltage subpanel for data terminations and provision for up to three accessory cards

B. Mechanical

- 1. It shall be constructed of 16-gauge steel. All panel components shall be properly treated, primed and finished in fine-textured, scratch resistant paint.
- 2. The 120V enclosure shall be 67.5" high by 14.36" wide and 4" deep and weigh no more than 80 pounds. The 277V panel shall be 67.5" high by 20" wide and 6" deep and weigh no more than 130 pounds.

3. The enclosure shall be capable of being mounted on the surface of a wall or recessed between standard width (16" on center) wall studs
 4. Choice of outer panels shall be available for flush or recess mount applications. This outer panel shall ship complete with a locking door to limit access to electronics, breakers, and local relay overrides.
 - a. Optional center-pin reject security screws shall be available for all accessible screws.
 - b. Flush mount door shall extend 1" beyond all panel edges to hide wall cut-out
 5. The unit shall provide interior cover to allow access only to class 2 wiring and prevent direct access to touch live components breakers and relays.
 6. Relay subpanel may include up to twenty-four 20 amp single pole, up to twelve 20 amp double pole, or eight three pole relays as required in any combination up to capacity.
 7. Relay override panel shall provide 24 button overrides which allow the user to directly change the state of any or all relays at the panel.
 - a. Relay overrides shall be available for each relay which indicate current state of the relay by way of LED indicator
 - b. Numerical circuit number reference which matches the relay to its breaker
 - c. Removable load schedule label shall be provided which allows the customer to name each of the relay circuits.
 8. Relay output lugs shall accept 6-14AWG copper wire
 9. Breaker subpanel may include up to twenty-four 20 amp single pole, up to twelve 20 amp double pole, or eight three pole breakers as required in any combination up to capacity.
 10. The control wiring shall land on a removable header for easy contractor installation (On-board DMX, station, and Emergency Input terminations).
- C. User Interface
1. The user interface shall contain a graphical display with button pad to include 0-9 number entry, up, down back arrow navigation and enter.
 2. Test shortcut button shall be available for local activation of preset, sequence and set level overrides.
 3. The user interface shall have a power status LED indicator (Blue), a DMX status LED indicator (Green), a network status LED indicator (Green) and an LED indicator (red) for errors.
 4. USB memory stick interface for uploads of setup and software updates
- D. Functional
1. Pack setup shall be user programmable. The control panel shall provide the following relay setup features (per circuit):
 - a. Type (1 pole, 2 pole, or 3 pole)
 - b. Name
 - c. Circuit
 - d. DMX address
 - e. sACN address
 - f. Space
 - g. Circuit Modes
 - 1) Normal (priority and HTP based activation)
 - 2) Latch-lock
 - 3) Fluorescent
 - 4) DALI
 - h. "On" threshold level
 - i. "Off" threshold level
 - j. Include in UL924 emergency activation
 - k. Allow Manual
 2. The panel shall be capable of switching all relays on or off at once, or in a user-selectable delay period of 0.1 to 60 seconds, in 0.1 second increments, per relay.
 3. Control electronics shall report the following information per branch circuit:
 - a. Breaker state

- b. Relay state
 - c. Current draw
 - d. Voltage
 - e. Energy usage over time
4. Built in Control shall include:
- a. From the control panel, stations, or timed events it shall be possible to record up to 16 presets per space for up to 8 spaces per panel.
 - 1) Presets shall be programmable by recording current levels (as set by DMX), by entering levels on the face panel directly, manually selecting relay state on each relay, or a combination of both methods.
 - b. From the control panel, stations, or timed events it shall be possible to record up to 16 zones per space.
 - c. Indication of an active preset shall be visible on the LCD display.
 - d. One 16-step sequence per space for power up and power down routines
 - e. The panel shall have a UL924-listed contact input for use in Emergency Lighting systems. The panel shall respond to the contact input by setting relays to "on", while setting non-emergency relays "off". Each relay can be selected for activation upon contact input.
 - f. Data lose behavior
5. The control of lighting and associated systems via timed and Astronomical clock controls.
- a. System shall allow the activation of presets, sequence, and zone programming of time clock events.
 - b. System time events shall be programmable via the face panel.
 - 1) Time clock events shall be assigned to system day types. Standard day types include: everyday, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday.
 - 2) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event.
 - 3) System shall automatically compensate for regions using a fully configurable daylight saving time.
 - 4) Presets shall be assigned to events at the time clock.
 - c. The time clock shall support event override
 - 1) It shall be possible to override the timed event schedule from the facepanel of the time clock
 - d. The time clock shall support timed event hold
 - 1) It shall be possible to hold a timed event from the facepanel of the processor
 - 2) Timed event hold shall meet California Title 24 requirements
6. The panel shall receive ESTA DMX512-A control protocol. Addressing shall be set via the user interface button keypad. Any switch may be patched to any DMX channel.
- a. 2,500V of optical isolation shall be provided between the DMX512 inputs and the control electronics as well as between control and power components.
 - b. The relays shall respond to control changes (DMX or Stations) in less than 25 milliseconds. DMX512 update speed shall be 40Hz.
 - c. Setting changes shall be able to be made across all, some, or just one selected relay in a single action from the face panel
 - d. Rack
 - 1) Quick rack setup shall be available to apply address settings across all circuits for rack number, DMX Start Address, sACN universe, and sACN start address.
 - 2) Emergency Setup Menu shall provide optional delays when emergency is activated or deactivated, and option to turn off non-emergency circuits shall be available. Record function shall allow circuits that are turned on to be added to the emergency setting.
7. Architectural Setup
- a. DMX loss behavior

- b. DMX priority
- c. Station power (on/off)
- d. Preset priority
- e. Backlight timeout and shutoff mode
- f. Contrast
- g. Language
- h. Spaces
- i. Network settings

E. Electrical

- 1. Modules available to support:
 - a. ERP 120/208V three phase 4-wire plus ground
 - b. ERP-2 120/240V single phase 3-wire plus ground
 - c. ERPA 277/480V, 230/400V and 240/415V three phase. 4-wire plus ground
- 2. The individual relays shall be mechanically latching
- 3. The relay shall be capable of switching 20A at up to 300V.
- 4. Max Feed size: 200 amp
- 5. Main circuit breaker options:
 - a. Main breaker shall be optionally available for purchase.
 - b. Main breaker shall be field installable
 - c. Main breakers options: 100 (150 amp at 277V) amp or 200 amp

OPERATING VOLTAGE	MCB OPTION	SCCR RATING	INPUT LUG WIRE SIZING
120/240V	100A,200A	22kA	1AWG – 300kcmil
120/208V	100A, 200A	10kA	3/0 – 300kcmil
	200A	22kA, 42kA	
277/480V	150A,200A	14kA	6AWG – 350kcmil
	200A	65kA	6AWG – 350kcmil
Ground Bar	NA	NA	14AWG – 2/0

A. Relay

- 1. Each relay shall have a manual override switch with on/off status indication.
- 2. 20A 277V Ballast (HID)
- 3. 16A Electronic Ballast up to 277V
- 4. 20A Tungsten up to 277V
- 5. 20FLA @ 120V Motor Load
- 6. 17 FLA @ 240V Motor Load
- 7. 14 FLA @ 277V Motor Load
- 8. Isolation: 4000V RMS
- 9. State: Latching
- 10. Life:
 - a. 100,000 cycles at full resistive load
 - b. 30,000 cycles motor, inductive, or tungsten
- 11. Current reporting accuracy: 5%

B. SCCR

- 1. System SCCR rating shall be a minimum of 10kA at 120V and 14kA at 277V when fitted with main lugs
- 2. System SCCR ratings shall be rated at:

OPERATING VOLTAGE	MCB OPTION	SCCR RATING
120/240V	None	10kA
	100A, 200A	22kA
120/208V	None, 100A, 200A	10kA
	200A	22kA, 42kA
277/480V	None, 150A, 200A	14kA
	200A	65kA

C. Accessories

- 1. The following accessories shall be optionally available:

- a. Network Interface
- b. Low voltage 0-10V Dimming Control
- c. Ride-Thru Option
- d. Main Breakers as shown in Section G.2

D. Thermal

- 1. The panel shall be convection cooled.
- 2. The panel shall operate safely in an environment having an ambient temperature between 32°F (0°C) and 104°F (40°C), and humidity between 5-95% (non-condensing).

2.06 POWER DISTRIBUTION – JUNCTION BOXES

A. General

- 1. Gridiron junction boxes shall be fabricated from 16-gauge cold rolled steel with 14 gauge end panels.
- 2. Junction boxes shall be finished with fine-textured, scratch-resistant, black powder coat.
 - a. Boxes for 30 circuits or less shall be 14”H x 14”W x 4”D
 - b. Boxes for 31 to 60 circuits shall be 14”H x 28”W x 4”D.
- 3. Junction boxes shall include mounting brackets and hardware
- 4. Cover(s) shall be 16-gauge cold rolled steel and hinge to allow installer to orient the hinged door to open in any horizontal direction.
- 5. Cover(s) shall be attached with machine screws and Tinnerman retainer nuts.

B. Electrical

- 1. Wiring terminations shall be made using feed through terminals individually labeled with corresponding circuit numbers.
 - a. 20 amp circuits shall use screwless tension clamp terminals listed for 20 – 8 gauge wire.
 - b. 50 amp circuits shall use compression terminals listed for 10 – 1 gauge wire.
 - c. 100 amp circuits shall use compression terminals listed for 8 – 2/0 gauge wire.
 - d. Terminals that place a screw directly on the wire are not acceptable.
- 2. Gridiron junction boxes shall be listed by a nationally recognized test lab (nrtl).
- 3. A low voltage distribution system shall be available to incorporate DMX, Ethernet or other protocols as specified with the gridiron junction box.
 - a. Low voltage junction boxes shall attach to gridiron junction boxes to simplify wiring to a discrete device
 - b. Low voltage signals shall enter the junction box via a strain relief or connector mounted in a separate low voltage terminal box on the top or bottom of the gridiron junction box.
 - c. Up to four low voltage cables shall be supported for each junction box location.

2.07 POWER DISTRIBUTION – OUTLET AND PIGTAIL BOXES

A. General

- 1. Connectors shall be available as 20A, 50A and 100A grounded stage pin, 20A twist lock and 20A “U” ground (dual rated “T-slot”); other connectors shall be available as specified.
- 2. Pigtails shall be three-wire type “SOW” rubber jacketed cable sized for the maximum circuit ampacity.
- 3. Pigtails with 20 amp stage pin connectors shall be terminated using 12 gauge 4 way indent crimp (with inspection window) type where the wire is inserted and crimped directly in the socket.
- 4. Terminations for pigtail connectors shall utilize feed- through terminals individually labeled with corresponding circuit numbers.
 - a. 20 amp circuits shall use screwless tension clamp terminals listed for 20 – 8 gauge wire.

- b. 50 amp circuits shall use compression terminals listed for 10 – 1 gauge wire.
 - c. 100 amp circuits shall use compression terminals listed for 8 – 2/0 gauge wire.
 - d. Terminals that place a screw directly on the wire are not acceptable.
5. Outlet and pigtail boxes shall be supplied with appropriate brackets and hardware for mounting as shown on the drawings
- a. Standard mounting options shall include pipe or wall mounting
 - b. Brackets shall be made from ASTM A 36 steel
 - c. Hardware shall be ASTM A307 grade 5.
6. A low voltage distribution system shall be available to incorporate DMX, Ethernet or other protocols as specified in the power distribution box.
- a. A voltage barrier shall be used to separate the low voltage wiring for the electrical circuits.
7. Power distribution equipment shall be listed by a nationally recognized test lab (nrtl).

B. Physical

1. Outlet and pigtail boxes shall be 6.25" H x 3.3" D and fabricated from 18 gauge galvanized steel and finished in black fine-texture powder coat paint.
- a. Covers shall be fabricated from 16-gauge galvanized steel
2. Outlet and pigtail boxes shall be available in any length specified in increments of 3-inches with a maximum length of up to 3-feet.
3. Pigtails and outlets shall be spaced on 18" centers, or as otherwise specified.
4. Outlets shall be mounted on individual 3" panels.
5. Circuits shall be labeled with 1.25" lettering.
- a. Circuit labeling options shall include:
 - 1) Circuits shall be labeled on the front side of the connector strip with white lettering on black background labels.
 - 2) Circuits shall be labeled on front and back sides of the connector strip with white lettering on black background labels.
 - 3) Circuits shall be labeled on the front side of the connector strip with engraved lamicoïd labels utilizing white lettering on black background labels.
 - 4) Circuits shall be labeled on the front and rear sides of the connector strip with engraved lamicoïd labels utilizing white lettering on black background labels.
 - 5) Circuits shall be labeled on one side of the connector strip using individual circuit cover plates with lettering engraved in the cover and filled with the specified color.
 - 6) Circuits shall be labeled using specified labeling per plans and drawings
6. Outlet and pigtail boxes shall support optional LED indicators to indicate the presence of power at each local circuit. The indicator shall be red in color and mounted in outlet or pigtail box.
- a. The LED indicator shall be mounted in the lower right corner of the outlet panel
 - b. The LED indicator shall be mounted in the bottom of the outlet or pigtail box directly below the outlet panel.
 - c. The LED indicator shall be mounted in the cover plate directly below the circuit label for pigtail circuits

2.08 DATA PLUG-IN STATIONS

A. General

1. The Plug-in Stations shall consist of the appropriate connectors required for the functional intent of the system. These stations shall be available with DMX input or output, Remote Focus Unit, Network, or architectural control connectors. Custom control connectors shall be available.

B. Connector Options

1. The following standard components shall be available for Plug-in Stations:
 - a. 5-Pin male XLR connectors for DMX input
 - b. 5-Pin female XLR connectors for DMX output
 - c. 6-Pin female XLR connectors for RFU and ETCLink connections
 - d. RJ45 connectors for Network connections - Twisted Pair
 - e. 6-Pin female DIN connectors for Unison connections
 - f. DB9 female serial connector for architectural control from a computer
 2. Custom combinations and custom control connections shall be available.
- C. Physical
1. Station faceplates shall be .80" aluminum, finished in fine texture, scratch-resistant black powder coat. Silk-screened graphics shall be white.
 2. The station panel shall mount into an industry standard back box, depending on size and quantity of connectors. A terminal block shall be supplied for contractor terminations.

2.09 COLOR MIXING LIGHT EMITTING DIODE WASH FIXTURE

- A. General
1. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a Desire D40 or D40 Studio as manufactured by Electronics Theatre Controls, Inc. or approved equal.
 2. All LED fixtures shall be provided by a single manufacturer to ensure compatibility
 3. The fixture shall be UL 1573 listed for stage and studio use
 4. The fixture shall comply with the USITT DMX-512 A standard
- B. Physical
1. The fixture shall be contained in a rugged all-metal die-cast housing, free of burrs and pits.
 2. The housing shall have a rugged black powdercoat finish
 - a. White or silver/gray powdercoat finishes shall be available as color options
 - b. Other powdercoat color options shall be available on request
 3. Power supply, cooling and electronics shall be integral to each unit.
 4. Fixture housing shall provide two easy-access slots for secondary lenses and other accessories
 - a. Slots shall be equipped with locking retaining clip
 5. The unit shall ship with:
 - a. Theatrical-style hanging yoke as standard
 - b. 5' power lead with Edison connector as standard
 - c. 25 deg. secondary lens as standard
 6. Available options shall include but not be limited to:
 - a. Yoke with floor stand conversion feature
 - b. Bare-end, Stage-Pin or Twist-lock type-equipped power leads
 - c. PowerCon to PowerCon cables for fixture power linking
 - d. Multiple secondary lens options to include multiple angles in the following patterns:
 - 1) Linear
 - 2) Round
 - 3) Oblong
 7. Light output shall be via a round aperture
 - a. Aperture and accessory slots shall accommodate standard 7.5" accessories such as used in other similar-sized fixtures
 - b. Accessories available as options shall include but not be limited to:
 - 1) Gel/diffusion frames
 - 2) Top hats
 - 3) Barndoors
 - 4) Egg crate louvers
 - 5) Concentric ring louvers

6) Multiple secondary lensing options

C. ENVIRONMENTAL AND AGENCY COMPLIANCE

1. The fixture shall be UL and cUL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.
2. The fixture shall be UL LISTED to the UL1573 standard for stage and studio use
3. The fixture shall be rated for IP-20 dry location use.

D. THERMAL

1. Fixture shall be totally convection cooled, requiring no cooling fan. Fixtures which require an on-board cooling fan shall not be acceptable unless pre-approved
2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 50,000 hours of use
 - a. Thermal management shall include multiple temperature sensors within the housing to include:
 - 1) LED array circuit board temperatures
 - 2) Temperature sensors placed on each individual LED color circuit
 - 3) Fixture ambient
 - 4) CPU
 - b. Fixture user shall permit monitoring of temperature sensors via a legible LCD multi-line backlit display
 - c. Fixtures that do not provide active thermal monitoring of LED circuits and other temperature readings shall not be acceptable
3. The fixture shall operate in an ambient temperature range of -20°C (-4°F) minimum, to 40° C (104°F) maximum ambient temperature.

E. ELECTRICAL

1. The fixture shall be equipped with 100V to 240V 50/60 Hz internal power supply
2. The fixture shall support power in and thru operation
 - a. Power in shall be via Neutrik® PowerCon™ input connector
 - b. Power thru shall be via Neutrik® PowerCon™ output connector
 - c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker
3. The fixture requires power from non-dim source
4. Power supply outputs shall have self-resetting current limiting protection
5. Power supply shall have power factor correction

F. LED Emitters

1. The fixture shall contain a minimum of 5 different LED colors to provide color characteristics as described in Section G below.
2. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - a. Fixture shall utilize Luxeon® Rebel™ LED emitters
3. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
4. LED emitters should be rated for nominal 50,000 hour LED life to 70% intensity
5. All LED fixtures (100% of each lot) shall undergo a minimum eight-hour burn-in test during manufacturing.
6. LED system shall comply with all relevant patents

G. CALIBRATION

1. Fixture shall be calibrated at factory for achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins
 - a. Calibration data shall be stored on the LED array as a permanent part of on-board operating system
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency
 - c. Fixtures not offering LED calibration shall not be acceptable

H. COLOR

1. The fixture shall utilize an minimum of 40 LED emitters
2. The fixture shall be available in specialized LED arrays as outlined below:
 - a. Desire D40
 - 1) Red, Amber, Green, Cyan, Blue, Indigo and White LEDs in an array designed for broad spectrum color, light tints, and variable whites. This array shall be the Lustr+ array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measured brightness of the Lustr+ array shall be greater than 2900 field lumens
 - 2) Red, Orange, Amber, Green, Cyan, Blue and Indigo LEDs in an array designed for broad spectrum deep colors. This array shall be the Vivid array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measured brightness of the Vivid array shall be greater than 2500 field lumens
 - 3) Red, Orange, Amber, Green and Indigo LEDs in an array designed for extra-high brightness output in red/warm end of the spectrum. This shall be the Fire array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measured brightness of the Fire array shall be greater than 2500 field lumens
 - 4) Red, Orange, Green, Cyan, Blue and Indigo LEDs in an array designed for extra-high brightness output in the blue/cool end of the spectrum. This shall be the Ice array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measured brightness of the Ice array shall be greater than 1800 field lumens
 - b. Desire D40 Studio
 - 1) Warm White, Cool White, Red, Green, Blue and Indigo LEDs in an array designed for high-brightness variable color temperature white light output. This shall be the Studio HD array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measure brightness of the Studio HD array shall be greater than 3100 field lumens
 - 2) All Warm White LEDs in an array designed for non-variable single color high-output, warm white light. This shall be the Studio Tungsten array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measure brightness of the Studio tungsten array shall be greater than (TBD) field lumens
 - 3) All Cool White LEDs in an array designed for non-variable single color high-output, cool white light. This shall be the Studio Daylight array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measure brightness of the Studio Daylight array shall be greater than (TBD) field lumens

I. DIMMING

1. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
2. At least four different dimming curve options shall be accessible at the fixture's User Interface
 - a. Incandescent
 - b. Standard
 - c. Linear
 - d. Quick
3. Dimming curves shall be optimized for smooth dimming over longer timed fades.

4. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
5. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment
 - b. PWM rates shall be adjustable by the user at the fixture if necessary to avoid any visible interference to video cameras and related equipment

J. CONTROL AND USER INTERFACE

1. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors
2. The fixture shall be compatible with the ANSI RDM E1.20 standard
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
3. The fixture shall be equipped with multi-line LCD display for easy-to-read status reports and configuration changes
4. The fixture shall be equipped with a six-button user-interface
5. The fixture shall offer multiple DMX input profile options to include:
 - a. RGB - control of all individual LED colors via a three-channel profile
 - 1) Red, Green, Blue
 - b. HSI – control of all individual LED colors via a three-channel profile
 - 1) Hue, Saturation, Intensity
 - c. HSIC – control of all LED colors via a four-channel profile
 - 1) Hue, Saturation, Intensity and Color Point
 - a) Color point provides variable color temperature settings
 - d. Direct – control of each individual color channel via an independent channel
 - e. A variable-rate strobe channel shall be provided
6. The fixture shall offer three output settings
 - a. Boost mode - powers LEDs at maximum intensity and provides no compensation against LED 'droop' or intensity loss
 - b. Regulated mode – slightly restricts maximum LED intensity levels to compensate against LED droop
 - c. Protected mode – further restricts maximum LED intensity levels to compensate against LED droop and offer color consistency at highest permissible ambient temperatures (40C)
 - d. Fixtures that do not provide regulated and protected operation modes are not acceptable
7. The fixture shall offer additional user-definable options to including but not limited to:
 - a. Display time out options
 - b. Loss of data behavior options
 - c. White point settings
 - d. Red-shift option for tungsten dimming emulation
8. The fixture shall offer five Quick Set-Ups to allow user to rapidly select different combinations of the numerous user options based on the desired usage situation, to include:
 - a. General – for most situations
 - b. Stage – when emulating incandescent fixtures is desired
 - c. High Impact – when maximum output and effect is desired
 - d. XT Arch – when color consistency and architectural characteristics are desired.
 - e. Studio - when DMX or stand-alone of white light output is required with intensity, color temperature and color tint control parameters
9. The fixture shall offer stand-alone functionality eliminating the need for a console
 - a. Fixture shall ship with 24 preset colors accessible as a stand-alone feature
 - b. Fixture shall ship with 12 Sequences accessible as a stand-alone feature

- c. Each color and sequence can be modified by the end user
- d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture
 - 1) Up to 32 fixtures may be linked
- e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming
- f. Fixtures without stand-alone operation features described in a, b, c, d, and e shall not be acceptable.

2.10 COLOR MIXING LIGHT EMITTING DIODE WASH FIXTURE

A. General

- 1. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a Desire D22 or D22 Studio as manufactured by Electronics Theatre Controls, Inc. or approved equal.
- 2. All LED fixtures shall be provided by a single manufacturer to ensure compatibility
- 3. The fixture shall be ETL listed to the following UL Standards:
 - a. Portable- UL153
 - a. Canopy- UL1598
 - b. Track- UL1574

B. Physical

- 1. The fixture shall be contained in a rugged all-metal die-cast housing, free of burrs and pits.
- 2. The housing shall have a rugged black powdercoat finish
 - a. White or silver/gray powdercoat finishes shall be available as color options
 - b. Other powdercoat color options shall be available on request
- 3. Power supply, cooling and electronics shall be integral to each unit.
- 4. Fixture housing shall provide two easy-access slots for secondary lenses and other accessories
 - a. Slots shall be equipped with locking retaining clip
- 5. The unit shall ship with (one of the following variants):
 - a. Portable
 - 1) Theatrical-style hanging yoke as standard
 - 2) 6' power lead with Edison connector (US)
 - 3) 6' power lead with Schuko/NF or UK 13A (Europe)
 - b. Canopy
 - 1) Installation canopy w/ termination board
 - c. Track
 - 1) Eutrac compatible track adapter
 - d. VN secondary lens as standard (included with all versions)
- 6. Available accessories shall include but not be limited to:
 - a. Multiple secondary lens options to include multiple angles in the following patterns:
 - 1) Linear
 - 2) Round
 - 3) Oblong
- 7. Light output shall be via a round aperture
 - a. Aperture and accessory slots shall accommodate a 5.5" accessories
 - b. Accessories available as options shall include but not be limited to:
 - 1) Gel/diffusion frames
 - 2) Top hats
 - 3) Barndoors
 - 4) Egg crate louvers
 - 5) Multiple secondary lensing options

C. Environmental and agency compliance

- 1. The fixture shall be ETL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.

2. The fixture shall be ETL LISTED to the following UL standards:
 - a. Portable- UL1598
 - b. Canopy- UL153
 - c. Track- UL1574
 3. The fixture shall be rated for IP-20 dry location use.
- D. Thermal
1. Fixture shall be totally convection cooled, requiring no cooling fan. Fixtures which require an on-board cooling fan shall not be acceptable unless pre-approved
 2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use
 - a. Thermal management shall include multiple temperature sensors within the housing to include:
 - 1) LED array circuit board temperatures
 - 2) Temperature sensors placed on each individual LED color circuit
 - 3) Fixture ambient
 - 4) CPU
 - b. Fixture user shall permit monitoring of temperature sensors via a legible LCD multi-line backlit display
 - c. Fixtures that do not provide active thermal monitoring of LED circuits and other temperature readings shall not be acceptable
 3. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.
- E. Electrical
1. The fixture shall be equipped with 100V to 240V 50/60 Hz internal power supply
 2. The fixture requires power from non-dim source
 3. Power supply outputs shall have self-resetting current limiting protection
 4. Power supply shall have power factor correction
- F. LED Emitters
1. The color changing fixture shall contain a minimum of 5 different LED colors to provide color characteristics as described in Section G below.
 2. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - a. Fixture shall utilize Luxeon® Rebel™ LED emitters
 3. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
 4. LED emitters should be rated for nominal 20,000 hour LED life to 70% intensity
 5. All LED fixtures (100% of each lot) shall undergo a minimum eight-hour burn-in test during manufacturing.
 6. LED system shall comply with all relevant patents
- G. Calibration
1. Fixture shall be calibrated at factory for achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins
 - a. Calibration data shall be stored on the LED array as a permanent part of on-board operating system
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency
 - c. Fixtures not offering LED calibration shall not be acceptable
- H. Color
1. The fixture shall utilize an minimum of 22 LED emitters
 2. The fixture shall be available in specialized LED arrays as outlined below:
 - a. Desire D22 Lustr+
 - 1) Red, Amber, Green, Cyan, Blue, Indigo and White LEDs in an array designed for broad spectrum color, light tints, and variable whites.

This array shall be the Lustr+ array as manufactured by Electronic Theatre Controls, or approved equal

- a) Measured brightness of the Lustr+ array shall be greater than 1500 field lumens
 - b. Desire D22 Studio
 - 1) Warm White, Cool White, Red, Green, Blue Cyan and PC-Amber LEDs in an array designed for high-brightness variable color temperature white light output. This shall be the Studio HD array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measure brightness of the Studio HD array shall be greater than 1550 field lumens
 - 2) All Warm White LEDs in an array designed for non-variable single color high-output, warm white light. This shall be the Studio Tungsten array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measure brightness of the Studio tungsten array shall be greater than (TBD) field lumens
 - 3) All Cool White LEDs in an array designed for non-variable single color high-output, cool white light. This shall be the Studio Daylight array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measure brightness of the Studio Daylight array shall be greater than (TBD) field lumens
- I. Dimming
1. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
 2. At least four different dimming curve options shall be accessible at the fixture's User Interface
 - a. Incandescent
 - b. Standard
 - c. Linear
 - d. Quick
 3. Dimming curves shall be optimized for smooth dimming over longer timed fades.
 4. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
 5. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment
 - b. PWM rates shall be adjustable by the user at the fixture if necessary to avoid any visible interference to video cameras and related equipment
- J. Control and user interface
1. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors (5-pin XLR on Portable only)
 2. The fixture shall be compatible with the ANSI RDM E1.20 standard
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
 3. The fixture shall be equipped with multi-line LCD display for easy-to-read status reports and configuration changes
 4. The fixture shall be equipped with a six-button user-interface
 5. The fixture shall offer multiple DMX input profile options to include:
 - a. RGB - control of all individual LED colors via a three-channel profile
 - 1) Red, Green, Blue
 - b. HSI – control of all individual LED colors via a three-channel profile

- 1) Hue, Saturation, Intensity
 - c. HSIC – control of all LED colors via a four-channel profile
 - 1) Hue, Saturation, Intensity and Color Point
 - a) Color point provides variable color temperature settings
 - d. Direct – control of each individual color channel via an independent channel
 - e. A variable-rate strobe channel shall be provided
- 6. The fixture shall offer three output settings
 - a. Boost mode - powers LEDs at maximum intensity and provides no compensation against LED 'droop' or intensity loss
 - b. Regulated mode – slightly restricts maximum LED intensity levels to compensate against LED droop
 - c. Protected mode – further restricts maximum LED intensity levels to compensate against LED droop and offer color consistency at highest permissible ambient temperatures (40C)
 - d. Fixtures that do not provide regulated and protected operation modes are not acceptable
- 7. The fixture shall offer additional user-definable options to including but not limited to:
 - a. Display time out options
 - b. Loss of data behavior options
 - c. White point settings
 - d. Red-shift option for tungsten dimming emulation
- 8. The fixture shall offer five Quick Set-Ups to allow user to rapidly select different combinations of the numerous user options based on the desired usage situation, to include:
 - a. General – for most situations
 - b. Stage – when emulating incandescent fixtures is desired
 - c. High Impact – when maximum output and effect is desired
 - d. XT Arch – when color consistency and architectural characteristics are desired.
 - e. Studio - when DMX or stand-alone of white light output is required with intensity, color temperature and color tint control parameters
- 9. The fixture shall offer stand-alone functionality eliminating the need for a console
 - a. Fixture shall ship with 24 preset colors accessible as a stand-alone feature
 - b. Fixture shall ship with 12 Sequences accessible as a stand-alone feature
 - c. Each color and sequence can be modified by the end user
 - d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture
 - 1) Up to 32 fixtures may be linked
 - e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming
 - f. Fixtures without stand-alone operation features described above shall not be acceptable.

2.11 COLOR MIXING OR WHITE-LIGHT LIGHT EMITTING DIODE PROFILE FIXTURE

- A. General
 - 1. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a Source Four LED as manufactured by Electronics Theatre Controls, Inc. or approved equal.
 - 2. All LED fixtures shall be provided by a single manufacturer to ensure compatibility
 - 3. The fixture shall be UL 1573 listed for stage and studio use
 - 4. The fixture shall comply with the USITT DMX-512A standard
- B. Physical
 - 1. The unit shall be constructed of rugged, die cast aluminum, free of burrs and pits, finished in black.
 - 2. The following shall be provided:
 - a. Lens secured with silicone shock mounts
 - b. Shutter assembly shall allow for +/-25° rotation

- c. 20 gauge stainless steel shutters
 - d. Interchangeable lens tubes for different field angles with Teflon guides for smooth tube movement
 - e. Sturdy integral die cast gel frame holders with two accessory slots, and a top-mounted, quick release gel frame retainer
 - f. Rugged steel yoke with two mounting positions allowing 300°+ rotation of the fixture within the yoke
 - g. Positive locking, hand operated yoke clutch
 - h. Slot with sliding cover for motorized pattern devices or optional iris
 - 3. The housing shall have a rugged black powder coat finish
 - a. White or silver/gray powder coat finishes shall be available as color options
 - b. Other powder coat color options shall be available on request
 - 4. Power supply, cooling and electronics shall be integral to each unit.
 - 5. The unit shall ship with:
 - a. Theatrical-style hanging yoke as standard
 - b. 5' Neutrik PowerCon™ to Edison power cable as standard
 - c. Gate diffuser
 - d. A-size pattern holder
 - 6. Available options shall include but not be limited to:
 - a. Bare-end, Stage-Pin or Twist-lock type-equipped power leads
 - b. PowerCon to PowerCon cables for fixture power linking
 - c. Smooth Wash Diffuser for overlapping beams of light from multiple fixtures
- C. Optical
- 1. The light beam should have a 2-to-1 center-to-edge drop-off ratio
 - 2. The unit shall provide, but not be limited to:
 - a. Low gate and beam temperature
 - b. Sharp imaging through a three-plane shutter design
 - 3. The unit shall provide, but not be limited to:
 - a. 5, 10, 14, 19, 26, 36, 50, 70 and 90 degree field angles
 - b. High-quality pattern imaging
 - c. Sharp shutter cuts without halation
 - d. Shutter warping and burnout in normal use shall be unacceptable
 - e. Adjustable hard and soft beam edges
 - 4. 19, 26, 36, and 50 degree units shall have optional lens tubes available for precision, high-contrast imaging.
- D. Environmental and Agency Compliance
- 1. The fixture shall be ETL and cETL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.
 - 2. The fixture shall be ETL LISTED to the UL1573 standard for stage and studio use
 - 3. The fixture shall be rated for IP-20 dry location use.
- E. Thermal
- 1. Fixture shall be equipped with a cooling fan.
 - a. Fan speed control via a DMX channel shall be possible
 - b. Fan speed software shall permit the fixture to override DMX fan speed setting to prevent heat damage to the fixture
 - 2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use
 - a. Thermal management shall include multiple temperature sensors within the housing to include:
 - 1) LED array circuit board temperatures
 - 2) Temperature sensors placed on each individual LED color circuit
 - 3) Fixture ambient
 - 4) CPU
 - b. Fixture user shall permit monitoring of temperature sensors via a legible LCD multi-line backlit display

- c. Fixtures that do not provide active thermal monitoring of LED circuits and other temperature readings shall not be acceptable
 - 3. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.
- F. Electrical
 - 1. The fixture shall be equipped with a 100V to 240V 50/60Hz internal power supply
 - 2. The fixture shall support power in and thru operation
 - a. Power in shall be via Neutrik® PowerCon™ input connector
 - b. Power thru shall be via Neutrik ® PowerCon™ output connector
 - c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker
 - 3. The fixture requires power from a non-dim source
 - 4. Power supply outputs shall have self-resetting current-limiting protection
 - 5. Power supply shall have power factor correction
- G. LED Emitters
 - 1. The fixture shall contain a minimum of five different LED colors to provide color characteristics as described in the Color Section below.
 - 2. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - a. Fixture shall utilize Luxeon® Rebel™ LED emitters
 - 3. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
 - 4. LED emitters should be rated for nominal 20,000-hour LED life to 70% intensity
 - 5. All LED fixtures (100% of each lot) shall undergo a minimum eight-hour burn-in test during manufacturing.
 - 6. LED system shall comply with all relevant patents
- H. Calibration
 - 1. Fixture shall be calibrated at factory for achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins
 - a. Calibration data shall be stored on the LED array as a permanent part of on-board operating system
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency
 - c. Fixtures not offering LED calibration shall not be acceptable
- I. Color
 - 1. The fixture shall utilize a minimum of 60 LED emitters
 - 2. The fixture shall be available in specialized LED arrays as outlined below:
 - a. Source Four LED Series 2 Lustr
 - 1) Red, Amber, Green, Cyan, Blue, Indigo and Lime LEDs in an array designed for broad spectrum color, light tints, and variable whites. This array shall be the Lustr array as manufactured by Electronic Theatre Controls, or approved equal
 - a) Measured brightness of the Lustr array shall be greater than 6,500 field lumens
- J. Dimming
 - 1. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
 - 2. At least four different dimming curve options shall be accessible at the fixture's User Interface
 - a. Incandescent
 - b. Standard
 - c. Linear
 - d. Quick

3. Dimming curves shall be optimized for smooth dimming over longer timed fades.
 4. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
 5. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment
 - b. PWM rates shall be adjustable by the user at the fixture if necessary to avoid any visible interference to video cameras and related equipment
- K. Control and User interface
1. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors
 2. The fixture shall be compatible with the ANSI RDM E1.20 standard
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
 3. The fixture shall be equipped with multi-line LCD display for easy-to-read status reports and configuration changes
 4. The fixture shall be equipped with a six-button user-interface
 5. The fixture shall offer multiple DMX input profile options to include:
 - a. RGB - control of all individual LED colors via a three-channel profile
 - 1) Red, Green, Blue
 - b. HSI – control of all individual LED colors via a three-channel profile
 - 1) Hue, Saturation, Intensity
 - c. HSIC – control of all LED colors via a four-channel profile
 - 1) Hue, Saturation, Intensity and Color Point
 - a) Color point provides variable color temperature settings
 - d. Direct – control of each individual color channel via an independent channel
 - e. Studio – Control of the fixture in a white-light 3 channel profile
 - 1) Intensity, Color Temperature, +/- Green (Tint)
 - a) Without DMX the fixture can master other Source Four LEDs and Desire fixtures that are connected via 5 pin XLR DMX cables
 - f. A variable-rate strobe channel shall be provided
 6. The fixture shall offer three output settings
 - a. Boost mode - powers LEDs at maximum intensity and provides no compensation against LED 'droop' or intensity loss
 - b. Regulated mode – slightly restricts maximum LED intensity levels to compensate against LED droop
 - c. Protected mode – further restricts maximum LED intensity levels to compensate against LED droop and offer color consistency at highest permissible ambient temperatures (40C)
 - d. Fixtures that do not provide regulated and protected operation modes are not acceptable
 7. The fixture shall offer additional user-definable options to including but not limited to:
 - a. Display time out options
 - b. Loss of data behavior options
 - c. White point settings
 - d. Red-shift option for tungsten dimming emulation
 8. The fixture shall offer five Quick Set-Ups to allow user to rapidly select different combinations of the numerous user options based on the desired usage situation, to include:
 - a. General – for most situations
 - b. Stage – when emulating incandescent fixtures is desired
 - c. High Impact – when maximum output and effect is desired

- d. XT Arch – when color consistency and architectural characteristics are desired.
 - e. Studio - when DMX or stand-alone of white light output is required with intensity, color temperature and color tint control parameters
9. The fixture shall offer stand-alone functionality eliminating the need for a console
- a. Fixture shall ship with 24 preset colors accessible as a stand-alone feature
 - b. Fixture shall ship with 12 sequences accessible as a stand-alone feature
 - c. Each color and sequence can be modified by the end user
 - d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture
 - 1) Up to 32 fixtures may be linked
 - e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming
 - f. Fixtures without stand-alone operation features described above shall not be acceptable.
10. The fixture shall be capable of copying all performance settings to other fixtures of the same type via a 5 pin XLR DMX cable

2.12 SOURCE FOUR LED CYC ADAPTER

- A. General
- 1. The adapter shall work with all Source Four LED light engines
 - 2. The adapter shall provide an evenly distributed light output when used in combination across large, flat surfaces
- B. Physical
- 1. The unit shall be constructed of rugged, die cast aluminum, free of burrs and pits, as well as injection molded ABS components; finished in black
 - 2. Any exposed optics (excludes mirrors) shall be constructed out of heat and impact resistant poly-carbonate material
 - 3. The unit shall attach securely to all Source Four LED light engines
- C. Optical
- 1. Unit should be able to be placed as close as 2 Ft. from the illuminated surface
 - 2. Unit should be able to be top or bottom mounted
 - 3. Unit should be able to achieve a 2:1 spacing
 - 4. Unit should be able to light a 40 Ft. cyclorama with a top and bottom hang
 - 5. Unit should maintain approximately 30% efficiency from source lumens to total field lumen output

2.13 Schedule of Quantities

Power Control System

<i>Description</i>	<i>Quantity</i>
Unison Echo Relay Panel with:	1
24 – Installed One Pole Relays	
25 – Installed One Pole Breakers	
1 – Surface Mount Front Door	
1 – Network Option Card	

Power and Data Distribution System

<i>Description</i>	<i>Quantity</i>
Pipe Mount Drop Box with:	8
2 – Panel Mount 20A Edison Duplex Connectors Wired On 2 – 20A Circuits	
1 – XLR 5-Pin DMX Output Connector with Voltage Barrier	
1 – Strain relief for incoming DMX cable	
C-Clamp Pipe Mounting Assembly (1 Pair)	8

12 Gauge, 5 Conductor SO Multi-Cable, 12'-0" Length	8
DMX Data Cable, 2-Pair and Shield, 22AWG with Black Polyurethane Jacket – 12'-0" Length	8
Dust-Tight Kellems Grip for SO Multicable	16
Gridiron Data Junction Box with Strain Relief	8
Gridiron Power Junction Box	4
Surface Mount Outlet Box with:	3
2 – Panel Mount 20A Edison Duplex Connectors Wired On 2 – 20A Circuits	
1 – XLR 5-Pin DMX Output Connector with Voltage Barrier	

Network Data System

Description	Quantity
Net3 Four Port Terminal Gateway with:	1
1 – Gateway Chassis	
4 – Terminal Modules	
1 – Rack Mount Kit	
Pathway Rack Mounted eDIN Enclosure with Power Supply and:	1
3 – eDIN 4-Way RDM Opto Splitter	
Two-Gang Plug-In Station (Flush Mount) with:	3
1 – XLR-5MDM3 DMX Input Connector	
1 – RJ-45 (568B) Connector in XLR Case	

Control System

Description	Quantity
Ion Console with 1024 Outputs/Parameters	1
Black Universal 1x20 Fader Wing	1
23" Multi-Touch Display with Wall-Mount Hanger	2
18" LED Littlite	1
Cat6 Network Patch Cable – 25'-0" Length	1

Fixture Package

Description	Quantity
ETC Selador D40 Studio HD Fixture with:	15
C-Clamp	
Safety Cable (Black)	
PowerCon Input Cable with NEMA 5-15 Plug	
5-Pin XLR Data Cable – 10'-0" Length	
PowerCon Thru Cable – 10'-0" Length	
ETC Selador D40 Very Narrow Round Diffuser	12
ETC Selador D40 Narrow Round Diffuser	12
ETC Selador D40 Medium Round Diffuser	12
ETC Selador D40 Wide Round Diffuser	12
ETC Selador D40 Xtra Wide Round Diffuser	12
ETC Selador D40 Narrow Oval Diffuser	12
ETC Selador D40 Medium Oval Diffuser	12
ETC Selador D40 Wide Oval Diffuser	12
ETC Selador D40 Very Narrow Linear Diffuser	24
ETC Selador D40 Narrow Linear Diffuser	24
ETC Selador D40 Medium Linear Diffuser	24
ETC Selador D40 Wide Linear Diffuser	24
ETC Selador Xtra Wide Linear Diffuser	24

ETC Source Four LED Leko Body, Series 2 Lustr Engine and Shutter Barrel with: C-Clamp Safety Cable (Black) PowerCon Input Cable with NEMA 5-15 Plug 5-Pin XLR Data Cable – 10'-0" Length PowerCon Thru Cable – 10'-0" Length	11
ETC Source Four Cyc Lenses with: Source Four LED Cyc Barn Door	8
ETC Source Four 36 Degree Enhanced Definition Lens Tube	2
ETC Source Four 50 Degree Enhanced Definition Lens Tube	2
ETC Source Four 70 Degree Lens Tube	2
ETC Source Four 90 Degree Lens Tube	2
ETC Selador D22 Studio HD with Canopy Mount Kit	3

PART 3 - EXECUTION

3.01 Field Quality Control

- A. Review the contract documents for performance criteria of the LED lighting systems.
- B. Coordinate the installation of the LED systems with electrical contractor and construction manager.
- C. Review electrical contractors' submittal documents and bills of materials prior to release for manufacturing to ensure delivery of a complete, working system in compliance with approved mockups and contract documents.
- D. Review the LED system installation for compliance with approved mockups, submittal documents and contract documents.
- E. Provide guidance and offer recommendations to the electrical contractor.
- F. Notify the construction manager of any installation conditions or gaps in the design scope that may be detrimental to the performance of the systems in part 2.02.

3.02 Project Management

- A. The LCSi shall designate a project manager.
- B. The LCSi's project manager shall be the main contact between the LCSi, manufacturers, design team and contractors from contract award through final sign off. The LCSi's project manager shall be the same person throughout the entire course of the project, unless otherwise approved by the design team.
- C. The LCSi's project manager either attend a kick-off meeting at the project site or, if that is not possible, at another designated place near the project site. The objectives of this meeting are:
 - 1. Introduce the project team members.
 - 2. Review the project schedule. Include in this schedule all manufacture lead time information and trade coordination information such that the schedule, when approved will not delay the installation of the system.
 - 3. Review the scope of work and any additional materials and documents not in the scope of work.
 - 4. Layout the intent of the project.

- D. The LCSI's project manager will stay in regular contact with the general contractor, architect, design team and/or owner's representative throughout the course of the project to update schedule, coordinate work, and communicate the effect of any changes that are made.

3.03 Low Voltage Data Terminations:

- A. Perform all lighting control system data terminations including, but not limited to network, dmx and fiberoptic terminations to manufacturer recommended specifications.

3.04 System Startup and Instruction

- A. LCSI shall field verify that the installation is ready for factory commissioning.
- B. LCSI shall coordinate system startup with the electrical contractor and lighting control system manufacturer.
- C. LCSI shall set control addresses and fixture configurations to approved settings based on mockups and submitted schedules.
- D. LCSI shall run tests and tune LED systems to match the performance requirements stated in the contract documents.
- E. When lighting system is fully operational, LCSI shall demonstrate operation for owner's representative.
- F. Once owner's representative has approved system operation, owner's representative shall have 1 week to hang and aim fixtures prior to system training.
- G. LCSI shall coordinate one eight-hour training session for the owner's representative. These sessions shall include training on the maintenance of the system and its components and operation of all luminaires control interfaces. LCSI is responsible for coordinating manufacturer personnel for this training and ensuring the completeness of this training.

END OF SECTION

SECTION 27 05 00 - COMMUNICATIONS RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Furnish and install backboxes, conduit, sleeves and raceway raceway system for communications (voice/data) system cabling as described herein and indicated on the drawings.
- B. Furnish and install backboxes, junction boxes, conduit and raceway system for future telecommunication systems as indicated on the Drawings.
- C. Provide telephone service raceway and termination backboards as indicated on the drawings.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
 - 1. 26 11 00 Raceways and Boxes
 - 2. 27 10 00 Communications Cabling and Equipment

PART 2 - PRODUCTS

2.1 COMMUNICATIONS RACEWAYS

- A. Communication Outlets: Telecommunication(voice/data) outlets shall be a 4" square box, 2-1/2" depth, with plaster ring for a single device. Stub 3/4" EMT conduit to above accessible ceiling with insulated bushing termination. Refer to the drawings for locations required.
 - 1. In hard ceiling areas, provide 3/4" EMT stub with bushing at back box and cable concealed to main distribution wiring closet.
 - 2. Provide EMT sleeves with bushing at both ends for penetration of masonry walls, floors and ceilings. Provide UL fire stopping at rated penetrations.
- B. Sleeves: Provide EMT conduit sleeves through walls between rooms with insulated bushing at both ends.

PART 3 - EXECUTION

3.1 COMMUNICATION RACEWAY INSTALLATION

- A. The E.C. shall install all required backboxes, conduits, sleeves and conduit fittings for the complete communication raceway system.
 - 1. All empty conduits shall be provided pull wire by E.C.
 - 2. Coordinate all work above the accessible ceilings with other trades.
 - 3. Seal all openings for sleeves between rooms for soundproofing.
- B. The E.C. shall coordinate installation with local Telephone Utility and Owner for new telephone service to the building.

END OF SECTION

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SECTION 27 10 00 - COMMUNICATION CABLING AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. THIS DOCUMENT SPECIFIES THE CITY OF MADISON REQUIREMENTS FOR PRODUCT DESIGN, PERFORMANCE, AND QUALITY ASSURANCE, AND CONTRACTOR RESPONSIBILITIES FOR EXECUTION OF WORK TO INSTALL A COMPLETE CATEGORY 6 STRUCTURED CABLING SYSTEM. EXECUTION OF WORK INCLUDES DELIVERY AND STORAGE OF MATERIALS, PREPARATION, INSTALLATION, FIELD-TESTING, AND PROJECT COMPLETION TASKS. SYSTEM CERTIFICATION AND WARRANTY SUBMITTAL REQUIREMENTS FOR COMPLETED WORK AND FUTURE MOVES, ADDS AND CHANGES (MAC'S) ARE ALSO SPECIFIED IN THIS DOCUMENT. COMPLIANCE TO APPLICABLE CODES, STANDARDS AND REGULATIONS IS REQUIRED FOR ALL CONSTRUCTION WORK PERFORMED.

1.2 SUMMARY

- A. SECTION INCLUDES PRODUCTS AND EXECUTION REQUIREMENTS PERTAINING TO DIVISION 27 SYSTEMS. COPPER AND FIBER BACKBONE AND HORIZONTAL CABLING ALONG WITH SUPPORT SYSTEMS ARE COVERED UNDER THIS DOCUMENT.
- B. PRODUCT SPECIFICATIONS, GENERAL DESIGN CONSIDERATIONS, AND INSTALLATION GUIDELINES ARE PROVIDED IN THIS DOCUMENT. QUANTITIES FOR ALL CABLING PRODUCTS SHALL BE PROVIDED AS REQUIRED TO COMPLETE CABLING TO ALL WORK STATIONS AS SHOWN ON FLOOR PLANS.
- C. THE APPROVED CONTRACTOR SHALL FURNISH, SUPPLY AND INSTALL A COMPLETE CATEGORY 6 CABLING INFRASTRUCTURE SPECIFIED IN THE CONTRACT DOCUMENTS.
- D. CONSTRUCTION WORK SHALL COMPLY WITH CONTRACT DRAWINGS, SPECIFICATIONS, PROJECT COMPLETION SCHEDULES, AND APPLICABLE CODES AND STANDARDS.
- E. WORK SHALL INCLUDE ALL DETAILED EXECUTION REQUIREMENTS, SUCH AS PREPARATION, INSTALLATION, SYSTEM CERTIFICATION, AND PROJECT CLOSEOUT ACTIVITIES ACCORDING TO THE CONTRACT.
- F. SUBSTITUTIONS: NO SUBSTITUTED PRODUCTS SHALL BE INSTALLED EXCEPT WITH WRITTEN APPROVAL BY OWNER.

1.3 DATA AND VOICE COMMUNICATIONS CONTRACT WORK

- A. GENERAL:
 - 1. FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT AND SERVICES FOR THE INSTALLATION IN ACCORDANCE WITH GENERAL PROVISIONS OF SPECIFICATIONS AND THE CONTRACT DRAWINGS.
 - 2. REPORT PERCENTAGE OF WORK COMPLETED ON A MONTHLY BASIS.
 - 3. COMPLETELY COORDINATE WITH WORK OF ALL OTHER TRADES.
 - 4. PROVIDE ALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION, WHETHER OR NOT SPECIFICALLY INDICATED IN THE CONTRACT DOCUMENTS.
 - 5. PROVIDE LABOR FOR TESTING HORIZONTAL AND BACKBONE CABLING.
 - 6. PROVIDE FIRESTOPPING.
 - 7. PROVIDE TELECOMMUNICATIONS GROUNDING AND BONDING.
- B. PROVIDE COMPLETE INSTALLATION FOR STRUCTURED TELECOMMUNICATIONS CABLING SYSTEM INCLUDING BUT NOT LIMITED TO:
 - 1. CATEGORY 6E UTP HORIZONTAL CABLES.
 - 2. SINGLEMODE OPTICAL FIBER BACKBONE CABLES.
 - 3. WORK AREA TELECOMMUNICATION OUTLETS.
 - 4. WALL MOUNTED VOICE OUTLETS.
 - 5. EQUIPMENT MOUNTING RACKS AND RACK ENCLOSURES.

6. CATEGORY 6 MODULAR PATCH PANELS.
7. OPTICAL FIBER PATCH PANELS.
8. OPTICAL FIBER LC CONNECTORS.
9. WIRE MANAGEMENT PANELS.
10. FIELD TESTING.
11. FIRESTOPPING.

1.4 SUBMITTALS

- A. SUBMITTALS SHALL BE COMPLETE AND AT ONE TIME. PARTIAL SUBMITTALS WILL NOT BE CONSIDERED.
- B. MATERIAL LISTS, SCHEDULE OF VALUES, LISTS OF SUBCONTRACTORS, AND PROOF OF CONTRACTOR QUALIFICATIONS SHALL BE PROVIDED TO ENGINEER UPON REQUEST AND SHALL FOLLOW THE GUIDELINES AS STATED IN THE GENERAL REQUIREMENTS (DIVISION 1 OF THE SPECIFICATION).
- C. SHOW DRAWINGS SHALL BE SUBMITTED. ALL COMMUNICATION SYSTEM SHOP DRAWINGS SHALL INCLUDE:
 1. MANUFACTURER'S DATA (SPECIFICATIONS, "CUT SHEETS").
 2. WIRING DIAGRAMS FOR ALL INSTALLED CABLING.
 3. EQUIPMENT RACK/CABINET LAYOUTS.
 4. PROPOSED LABELING SCHEMES AND LABELING METHOD.
 5. LIST OF CABLING DISTANCES (TYPICAL AND MAXIMUM) FOR ALL STRUCTURED CABLING
 6. SUBMIT COPIES OF CERTIFICATIONS FOR ALL TECHNICIANS AND THE PROJECT MANAGER WHO WILL SUPPORT THIS PROJECT. THE CERTIFICATIONS SHALL INCLUDE:
 - a STRUCTURED CABLING AND TERMINATION EQUIPMENT INSTALLATION CERTIFICATIONS FOR COPPER AND OPTICAL FIBER CONNECTIVITY AND CABLING.
 - b APPROVED MANUFACTURER CLASSES SATISFACTORILY COMPLETED.
 7. CONTRACTOR SHALL SUBMIT A TEST PLAN THAT DEFINES THE TESTS REQUIRED TO ENSURE THAT THE SYSTEM MEETS TECHNICAL, OPERATIONAL, AND PERFORMANCE SPECIFICATIONS 45 DAYS PRIOR TO PROPOSED TEST DATE.
 8. WORK SHALL NOT PROCEED WITHOUT THE OWNER'S APPROVAL OF THE SUBMITTED ITEMS.
- D. DRAWINGS & INSPECTION OF SITE:
 1. COMMUNICATIONS FLOOR PLAN DRAWINGS ARE TO SCALE AND TYPICALLY ARE NOT DIMENSIONED. THE CONTRACTOR SHALL NOT SCALE DRAWINGS FOR EQUIPMENT PLACEMENT AND CLEARANCES. DIMENSIONS GIVEN ON DRAWINGS SHALL ALWAYS TAKE PRECEDENCE OVER SCALED DRAWINGS.
 2. ANY EXISTING WIRES, UTILITIES, OR EQUIPMENT SHOWN ON THE DRAWINGS ARE SHOWN FOR GENERAL INFORMATION AND TO THE BEST KNOWLEDGE OF THE ENGINEER. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING WIRES, UTILITIES, OR EQUIPMENT.
 3. THE CONTRACTOR SHALL FIELD VERIFY DISTANCES AND EQUIPMENT PLACEMENTS COORDINATING LOCATIONS WITH OTHER TRADES, CONSTRUCTION MANAGERS, AND GENERAL CONTRACTOR PRIOR TO INSTALLATION.
 4. THE CONTRACTOR SHALL REVIEW ALL SITE CONDITIONS PRIOR TO SUBMITTING A BID ON THIS PROJECT. ANY OBVIOUS DISCREPANCIES BETWEEN THE SITE CONDITIONS AND BIDDING DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AT THE TIME OF BIDDING SO CLARIFICATION CAN BE MADE BY ADDENDUM.

- 5. CHANGE ORDER REQUESTS FOR ADDITIONAL COSTS RELATED TO THE CONTRACTORS MISUNDERSTANDING RELATED TO THE AMOUNT OF WORK INVOLVED AND LACK OF KNOWLEDGE RELATED TO THE SITE CONDITIONS WILL NOT BE ALLOWED.
- E. TEST REPORTS: SUBMIT COPIES OF COMPLETE REPORTS OF ALL TESTING PERFORMED TO THE GENERAL CONTRACTOR, WITH COPIES TO THE ARCHITECT'S ELECTRICAL ENGINEER UPON COMPLETION OF JOB.

1.5 APPROVED CONTRACTOR QUALIFICATIONS

- A. THE CONTRACTOR SHALL HAVE EXPERIENCE IN THE INSTALLATION AND TESTING OF SIMILAR SYSTEMS AS SPECIFIED HEREIN AND SHALL HAVE COMPLETED AT LEAST TWO PROJECTS OF SIMILAR SIZE AND SCOPE WITHIN THE LAST 24 MONTHS. THE CONTRACTOR SHALL PROVIDE REFERENCES UPON REQUEST (INCLUDING THE PROJECT NAME, ADDRESS, DATE OF IMPLEMENTATION, CLIENT NAME, TITLE, TELEPHONE NUMBER, AND PROJECT DESCRIPTION."
- B. ALL MEMBERS OF THE INSTALLATION TEAM MUST BE CERTIFIED BY THE MANUFACTURER AS HAVING COMPLETED THE NECESSARY TRAINING TO COMPLETE THEIR PART OF THE INSTALLATION. ALL PERSONNEL SHALL BE ADEQUATELY TRAINED IN THE USED OF SUCH TOOLS AND EQUIPMENT AS REQUIRED.
- C. THE CONTRACTOR BIDDING ON COMMUNICATION SYSTEMS SPECIFIED HEREIN SHALL BE CERTIFIED BY THE CONNECTIVITY MANUFACTURER TO INSTALL, SERVICE, AND WARRANTY THE SPECIFIED PRODUCT PRIOR TO THE TIME OF BID AND THROUGHOUT THE DURATION OF THE INSTALLATION. MANUFACTURER CERTIFICATIONS SHALL NOT BE PROJECT SPECIFIC AND SHOULD BE VALID FOR ANY AND ALL PROJECTS COMPLETED BY CONTRACTOR.
- D. THE CONTRACTOR SHALL OWN AND MAINTAIN TOOLS, INSTALLATION EQUIPMENT, AND TEST EQUIPMENT NECESSARY FOR SUCCESSFUL INSTALLATION AND TESTING OF OPTICAL AND CATEGORY 5E, 6 & 6A PREMISE DISTRIBUTION SYSTEMS.
- E. THE OWNER RESERVES THE RIGHT TO REQUIRE THE CONTRACTOR TO REMOVE FROM THE PROJECT ANY SUCH EMPLOYEE THE OWNER DEEMS TO BE INCOMPETENT, CARELESS OR INSUBORDINATE.
- F. THE CONTRACTOR MUST MAINTAIN A STATE CONTRACTOR'S LICENSE AS REQUIRED BY THE STATE.

1.6 APPROVED PRODUCT MANUFACTURERS

- A. THE MANUFACTURER OF THE CONNECTIVITY PRODUCTS SPECIFIED IN THIS DOCUMENT, AS REQUIRED FOR CONSTRUCTION OF THE CABLING INFRASTRUCTURE PER CONTRACT DOCUMENTS SHALL BE:
 - 1. HUBBELL PREMISE WIRING
- B. THE MANUFACTURER OF THE CABLING PRODUCTS SPECIFIED IN THIS DOCUMENT, AS REQUIRED FOR CONSTRUCTION OF THE COPPER CABLE INFRASTRUCTURE PER CONTRACT DOCUMENTS SHALL BE:
 - 1. MOHAWK CABLE
- C. THE MANUFACTURER OF THE FIBER OPTIC CABLING PRODUCTS SPECIFIED IN THIS DOCUMENT, AS REQUIRED FOR CONSTRUCTION OF THE FIBER OPTIC CABLE PER CONTRACT DOCUMENTS SHALL BE:
 - 1. MOHAWK CABLE OR EQUAL

- D. PRODUCT SUBSTITUTIONS ARE PERMITTED UNDER THE CONDITIONS STATED BELOW. (1.7 A)

1.7 PRODUCT SUBSTITUTIONS

- A. PRODUCT SUBSTITUTIONS FROM OTHER MANUFACTURERS SHALL REQUIRE THE APPROVAL OF THE OWNER OR OWNER'S REPRESENTATIVE.

1.8 QUALITY ASSURANCE

- A. INSTALLED CATEGORY 6 BALANCED UTP AND FIBER CABLING SYSTEMS, PATHWAYS AND DISTRIBUTION FACILITIES SHALL ADHERE TO MANUFACTURER'S INSTRUCTIONS, CONTRACT DRAWINGS AND SPECIFICATIONS, AND APPLICABLE CODES, STANDARDS AND REGULATIONS.
- B. INSTALLED CATEGORY 6 BALANCED UTP CABLING SYSTEMS AND FIELD TEST RESULTS SHALL STRICTLY ADHERE TO REQUIREMENTS OF ANSI/TIA/EIA-568-C.0 AND ANSI/TIA/EIA-568-C.2.
- C. INSTALLED OPTICAL FIBER CABLING SYSTEMS AND FIELD TEST RESULTS SHALL STRICTLY ADHERE TO REQUIREMENTS OF ANSI/TIA/EIA-568-C.0 AND ANSI/TIA/EIA-568C.3.
- D. WHERE APPLICABLE, ALL EQUIPMENT, COMPONENTS, ACCESSORIES AND HARDWARE SHALL BE UL LISTED FOR THE INTENDED PURPOSE OF THE INSTALLATION.
- E. INSTALLED PRODUCTS SHALL BE MANUFACTURED BY AN ISO 9001 CERTIFIED FACILITY.
- F. INSTALLED PRODUCTS SHALL BE FREE FROM DEFECTS IN MATERIAL OR WORKMANSHIP FROM THE MANUFACTURER, AND SHALL BE OF THE QUALITY INDICATED.
- G. ALL METHODS OF CONSTRUCTION THAT ARE NOT SPECIFIED IN THE CONTRACT DOCUMENTS SHALL BE SUBJECT TO CONTROL AND APPROVAL BY THE OWNER OR OWNER'S REPRESENTATIVE.
- H. INSTALLED PRODUCTS SHALL BE LOT-TRACEABLE BY DATE CODE.
- I. ALL CRITICAL INTERNAL MANUFACTURING OPERATIONS FOR INSTALLED PRODUCTS SHALL HAVE DOCUMENTED IN-PROCESS INSPECTION AND TESTING ACCORDING TO ISO9001.

1.9 DRAWINGS

- A. APPROVED OR PRELIMINARY CONTRACT DRAWINGS FURNISHED AT THE TIME OF BID SOLICITATION SHALL SERVE AS THE BASIS FOR PRODUCT SELECTION, CREATION OF BILLS OF MATERIAL, AND DETERMINATION OF LABOR CONTENT.
- B. CHANGES, ADDITIONS, OR DELETIONS TO CONTRACT DRAWINGS PRIOR TO AWARDING OF THE CONTRACT, SHALL REQUIRE AN AMENDMENT TO THE ORIGINAL BID.
- C. PRIOR TO SUBMITTING THE BID, IN REVIEWING THE CONTRACT DRAWINGS, THE APPROVED CONTRACTOR SHALL:
 - 1. REQUEST THE ATTENTION OF THE ENGINEER, OWNER, OR DESIGN AGENCY TO CLARIFY ANY MATERIALS, APPARATUS OR WORK BELIEVED TO BE INCORRECT, INADEQUATE, OMITTED, OR IN VIOLATION OF APPLICABLE CODES, STANDARDS OR REGULATIONS.
 - 2. NOTE ANY CONTINGENCIES RELATED TO UNKNOWN ASPECTS OF ANY DRAWINGS OR SPECIFICATIONS.
- D. CONTRACT DRAWINGS, PRIOR TO EXECUTION OF THE PROJECT, SHALL BE FORMALLY APPROVED AND RELEASED BY THE ENGINEER OR DESIGN AGENCY, AND SHALL BE APPROVED BY THE OWNER OR OWNER'S REPRESENTATIVE.
- E. EXECUTION OF WORK SHALL BE ACCORDING TO APPROVED DRAWINGS, IN ADDITION TO APPLICABLE SPECIFICATIONS AND CONTRACTUAL OBLIGATIONS.

1.10 APPLICABLE STANDARDS, CODES, AND REGULATIONS

- A. INSTALLATION STANDARDS: CABLE INSTALLATION SHALL COMPLY WITH THE FOLLOWING:
 - 1. AMERICAN NATIONAL STANDARDS INSTITUTE, (ANSI)
 - a. ANSI/TIA-568-C.0, "GENERIC TELECOMMUNICATIONS CABLING FOR CUSTOMER PREMISES", PUBLISHED 2009

- b ANSI/TIA-568-C.1, "COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD", PUBLISHED 2009
- c ANSI/TIA-568-C.2, "BALANCED TWISTED-PAIR TELECOMMUNICATION CABLING AND COMPONENTS STANDARD", PUBLISHED 2009
- d ANSI/TIA-568-C.3, "OPTICAL FIBER CABLING COMPONENTS STANDARD", PUBLISHED 2008, ERRATA ISSUED IN OCTOBER, 2008
- e ANSI/TIA-568-C.4, "COAXIAL CABLING COMPONENT STANDARD " PUBLISHED 2010
- f ANSITIA/EIA-569-B, COMMERCIAL BUILDING STANDARDS FOR TELECOMMUNICATIONS PATHWAYS AND SPACES, 2003.
- g ANSI/TIA-607-B, COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS, 2010.
- h ANSI/TIA/EIA-942, TELECOMMUNICATIONS INFRASTRUCTURE FOR DATA CENTERS, 2004.
- i ANSI/ICEA S-83-596, FIBER OPTIC PREMISES DISTRIBUTION CABLE, 2001.
- j ANSI/TIA/EIA-598, COLOR CODING OF OPTICAL FIBER CABLES, 2001
- k ANSI/ICEA S-87-640, FIBER OPTIC OUTSIDE PLANT DISTRIBUTION CABLE, 1999.
- l ANSI/TIA/EIA-492AAAC, DETAIL SPECIFICATION FOR 850NM LASER-OPTIMIZED 50UM CORE DIAMETER/125 UM CLADDING DIAMETER CLASS 1A GRADED INDEX MULTIMODE OPTICAL FIBERS, 2003.
- m ANSI/TIA/EIA-492CAAA, DETAIL SPECIFICATION FOR CLASS IVA DISPERSION-UNSHIFTED SINGLEMODE OPTICAL FIBERS, 2002.
- n ANSI/TIA/EIA-758: CUSTOMER-OWNED OUTSIDE PLANT TELECOMMUNICATIONS CABLING STANDARD, 2004.
- o ANSI/TIA/EIA-526-7, OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED SINGLEMODE FIBER PLANT: OFSTP-7, 2002.
- p ANSI/TIA/EIA-526-14-A, OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED MULTIMODE FIBER PLANT: OFSTP-14A, 2003.
- q ANSI/TIA/EIA-TSB-125, GUIDELINES FOR MAINTAINING OPTICAL FIBER POLARITY THROUGH REVERSE-PAIR POSITIONING, 2001.
- r ANSI/TIA/EIA-TSB-140, ADDITIONAL GUIDELINES FOR FIELD TESTING LENGTH, LOSS, AND POLARITY OF OPTICAL FIBER CABLING SYSTEMS, 2004.
- s ANSI/TIA/EIA-606-A, ADMINISTRATION STANDARD FOR COMMERCIAL TELECOMMUNICATIONS INFRASTRUCTURE, 2002.
- t ANSI/EIA-310-D, CABINETS, RACKS, PANELS, AND ASSOCIATED EQUIPMENT, 1992.
- u ANSI/TIA/EIA-604 (SERIES), FOCIS FIBER OPTIC CONNECTOR INTERMATEABILITY STANDARD, 2000-2003.
- 2. NATIONAL FIRE PROTECTION ASSOCIATION, INC., NFPA 70
- 3. NATIONAL ELECTRIC CODE (NEC), 2005.
 - a NEC ARTICLE 250: GROUNDING
 - b NEC ARTICLE 386: SURFACE METAL RACEWAYS
 - c NEC ARTICLE 388: SURFACE NON-METALLIC RACEWAYS
 - d NEC ARTICLE 800: COMMUNICATIONS CIRCUITS
 - e NEC ARTICLE 770: OPTICAL FIBER CABLES AND RACEWAY
- 4. UNDERWRITER'S LABORATORY, INC. (UL)

- a UL-5A: STANDARD FOR NON-METALLIC RACEWAYS AND FITTINGS
 - b UL-5: STANDARD FOR SURFACE METAL RACEWAYS AND FITTINGS
 - c UL-5C: STANDARD FOR SURFACE RACEWAYS AND FITTINGS FOR USE WITH DATA, SIGNAL, AND CONTROL CIRCUITS
 - d UL-50: STANDARD FOR ENCLOSURES FOR ELECTRICAL EQUIPMENT
 - e UL-94-V0: TESTS FOR FLAMMABILITY OF PLASTIC MATERIALS
 - f UL-498: ATTACHMENT PLUGS AND RECEPTACLES
 - g UL-1479: FIRE TESTS OF THROUGH-PENETRATION FIRESTOPS (IN ACCORDANCE WITH ASTM E814).
 - h UL-1863: STANDARD FOR SAFETY OF COMMUNICATIONS CIRCUIT ACCESSORIES
5. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)
 - a ANSI/NEMA WD-6-2002: WIRING DEVICES – DIMENSIONAL REQUIREMENTS
 - b NEMA 250-2003: ENCLOSURES FOR ELECTRICAL EQUIPMENT
 6. ISO/IEC 11801, ED. 2:2002, INFORMATION TECHNOLOGY – GENERIC CABLING FOR CUSTOMER PREMISES, 2002.
 7. ISO/IEC 18010, INFORMATION TECHNOLOGY – PATHWAYS AND SPACES FOR CUSTOMER PREMISES CABLING, 2005.
 8. ISO/IEC 14763-1, INFORMATION TECHNOLOGY – IMPLEMENTATION AND OPERATION OF CUSTOMER PREMISES CABLING – PART 1: ADMINISTRATION, 2004.
 9. CSA C22.1-06, CANADIAN ELECTRIC CODE (CEC), 2006
 10. FEDERAL COMMUNICATIONS COMMISSION (FCC) TITLE 47, CODE OF FEDERAL REGULATIONS, PART 68: CONNECTION OF TERMINAL EQUIPMENT TO THE TELEPHONE NETWORK, 1998.
 11. U.S. PUBLIC LAW 336. 101ST CONGRESS, ADA: AMERICANS WITH DISABILITIES ACT OF 1992.
 12. IEEE 802.3AF, DATA TERMINAL EQUIPMENT (DTE) POWER OVER MEDIA DEPENDENT INTERFACE (MDI), 2003.
 13. IEEE 802.3AT (CURRENT DRAFT), DATA TERMINAL EQUIPMENT (DTE) ENHANCED POWER OVER MEDIA DEPENDENT INTERFACE (MDI).
 14. IEEE 802.3AE, SPECIFICATION FOR 10 GBIT/S ETHERNET OPERATION OVER OPTICAL FIBER.
 15. TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL, 11TH ED., BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI), 2006.
 16. INFORMATION TRANSPORT SYSTEMS INSTALLATION MANUAL, 4TH ED., BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI), 2004.
- B. THIS DOCUMENT IS NOT A SUBSTITUTE FOR ANY CODE, STANDARD OR REGULATION. THE APPROVED CONTRACTOR MUST BE AWARE OF LOCAL CODES THAT MAY IMPACT THE BID SUBMITTAL OR EXECUTION OF THE PROJECT. THE CURRENT REVISION OF ANY APPLICABLE CODE, STANDARD, OR REGULATION SHALL TAKE PRECEDENCE AT THE POINT OF PROJECT EXECUTION, UNLESS OTHERWISE RECOGNIZED BY LOCAL AUTHORITIES. APPLICABLE STANDARDS OR CODES THAT AFFECT CONSTRUCTION, WHICH ARE LISTED AS NORMATIVE REFERENCES WITHIN ANY GOVERNING DOCUMENT, ARE ALSO THE RESPONSIBILITY OF THE APPROVED CONTRACTOR FOR COMPLIANCE.
- C. MATERIALS:
1. ALL MATERIALS SHALL BE UL OR ETL LISTED AND VERIFIED AND SHALL BE MARKED AS SUCH.
 2. PRODUCTS SHALL BE REGULARLY CATALOGUED ITEMS OF THE MANUFACTURER AND SHALL BE SUPPLIED AS A COMPLETE UNIT IN ACCORDANCE WITH THE

MANUFACTURER'S STANDARD SPECIFICATIONS WITH ANY OPTIONAL ITEMS REQUIRED FOR PROPER INSTALLATION UNLESS OTHERWISE NOTED.

3. MATERIAL SHALL BE DELIVERED TO THE SITE IN THE ORIGINAL PACKING.

1.11 MAINTENANCE

- A. ALL MATERIALS USED ON THIS PROJECT SHALL BE NEW. USED AND REFURBISHED EQUIPMENT IS NOT PERMITTED UNLESS APPROVED BY CITY OF MADISON. PROVIDE EQUIPMENT TO SITE IN ORIGINAL PACKAGING WHENEVER PRACTICAL.
- B. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING ALL DELIVERIES AND PROVIDING PROPER RECEIPT, HANDLING, AND STORAGE OF ALL MATERIALS. PROTECT ALL EQUIPMENT FROM PHYSICAL DAMAGES (DENTS, SCRATCHES, DUST, WATER, PAINT, CHEMICALS, AND TEMPERATURE EXTREMES) AND VANDALISM, OR THEFT. THE CONTRACTOR SHALL REPLACE ANY DAMAGED OR STOLEN EQUIPMENT. THE CONTRACTOR IS RESPONSIBLE FOR ALL EQUIPMENT UNTIL FINAL PROJECT ACCEPTANCE BY OWNER.
- C. MAINTENANCE OF THE CABLING INFRASTRUCTURE IS TO BE DONE BY AUTHORIZED PERSONNEL ONLY, OR VOID OF MANUFACTURER'S WARRANTY MAY RESULT. IT IS THE RESPONSIBILITY OF THE OWNER OR END USER TO UTILIZE A CERTIFIED INSTALLER TO MAINTAIN WARRANTY COVERAGE ON EXISTING OR NEW CABLING INFRASTRUCTURE.
- D. THE TELECOMMUNICATIONS CONTRACTOR SHALL FURNISH A QUOTATION FOR TIME AND MATERIAL TO PERFORM MAINTENANCE AND REPAIRS. THE OWNER HAS THE FIRST RIGHT OF REFUSAL OF SELECTING A SUITABLE CONTRACTOR OR QUALIFIED INTERNAL PERSONNEL TO PERFORM MAINTENANCE AND REPAIRS ON STRUCTURED CABLING.
- E. ADDITIONS OF NEW CABLING, EITHER HORIZONTAL OR BACKBONE, SHALL BE COMPLETED, TESTED, AND DOCUMENTED INTO PERMANENT BUILDING RECORDS. NEW CABLING INSTALLATIONS INTENDED TO BE COVERED BY THE MANUFACTURER'S WARRANTY SHALL ADHERE TO THE DOCUMENTATION SUBMITTAL AND SYSTEM CERTIFICATION PROVISIONS STATED ABOVE.
- F. THE CONTRACTOR IS RESPONSIBLE FOR CLEANING THE WORKSITE EVERY BUSINESS DAY AND REMOVE DEBRIT FROM THE FACILITY.

1.12 DOCUMENTATION

- A. TEST RESULTS
 1. ALL TEST RESULTS ARE TO BE SAVED ELECTRONICALLY ON CD. TEST DOCUMENTATION SUBMITTED ON DISK SHALL BE CLEARLY MARKED ON THE COVER WITH THE WORDS "PROJECT TEST DOCUMENTATION", THE PROJECT NAME, AND THE DATE OF COMPLETION (MONTH AND YEAR). FOR MULTIPLE BUILDINGS, THE BUILDING NAME, INCLUDING FLOOR OR WING I.D. SHOULD ALSO BE INCLUDED ON THE TEST RESULTS DISK.
 2. FILE NAMES OF THE TEST RESULTS RECORDED FOR EACH LINK SHALL MATCH THE OFFICIAL IDENTIFICATION. TEST RESULTS SHALL INCLUDE A COMPLETE RECORD FOR EACH LINK, INCLUDING TYPE OF TEST, CABLE TYPE, CABLE/PORT I.D., MEASUREMENT DIRECTION, REFERENCE SETUP, DATE, AND TECHNICIAN'S NAME(S).
 3. THE TEST EQUIPMENT NAME, MANUFACTURER, MODEL NUMBER, SERIAL NUMBER, SOFTWARE VERSION AND LAST CALIBRATION DATE SHALL ALSO BE PROVIDED IN THE TEST RESULTS DOCUMENTATION.
 4. WHEN REPAIRS AND RE-TESTS ARE PERFORMED, THE PROBLEM CAUSE AND CORRECTIVE ACTION TAKEN SHALL BE NOTED, AND BOTH THE FAILED AND PASSED TEST DATA SHALL BE DOCUMENTED.
 5. THE OWNER, ENGINEER, LEAD PROJECT MANAGER, OR OWNER'S REPRESENTATIVE RESERVE THE RIGHT TO REQUEST VERIFICATION OF TEST RESULTS WITH A RE-TEST OF INSTALLED CABLES, ON A SAMPLING BASIS. RE-TESTING SHALL BE AT THE EXPENSE OF THE INSTALLER UNLESS OTHERWISE NOTED IN THE CONTRACT DOCUMENTS.
- B. AS BUILT DRAWINGS
 1. DEVIATIONS FROM THE APPROVED DRAWINGS, WHETHER OR NOT A CHANGE ORDER IS SUBMITTED, SHALL BE CLEARLY DENOTED AS BUILT ON THE WORKING HARD COPY DRAWING BY THE TELECOMMUNICATIONS CONTRACTOR. AS-BUILT DRAWINGS SHALL BE RETURNED PROMPTLY TO THE OWNER OR DESIGN AGENT

FOR COMPLETION OF DRAFTING REVISIONS TO THE ORIGINAL DESIGN. SEE "DOCUMENTATION – CHANGE ORDERS" BELOW. MANUFACTURER'S WARRANTY REGISTRATIONS MAY ALSO REQUIRE AS-BUILT DRAWINGS.

2. FLOOR PLAN DRAWINGS SHALL AT MINIMUM INCLUDE DETAILED CABLE AND PATHWAY LAYOUTS, EXACT LOCATIONS OF WORKSTATION OUTLETS, AND CABLE DISTRIBUTION HARDWARE LOCATIONS. WORKSTATION OUTLETS SHALL HAVE ALPHANUMERIC IDENTIFIERS ON THE DRAWINGS AS SPECIFIED BY THE END USER OR OWNER.

C. CHANGE ORDERS

1. ANY DEVIATION FROM THE APPROVED CONTRACT DRAWINGS OR SPECIFICATIONS SHALL BE SUBMITTED AS A WRITTEN CHANGE ORDER.
2. EXECUTION OF WORK, TO PERFORM CHANGES, SHALL NOT PROCEED WITHOUT PRIOR WRITTEN APPROVAL. ANY CHANGES DONE WITHOUT WRITTEN APPROVAL WILL BE AT NO COST TO CITY OF MADISON . IF THE WORK IS SHOWN TO BE INCORRECT THE CONTRACTOR WILL HAVE TO CORRECT THE PROBLEM AT NO COST TO CITY OF MADISON .
3. SIGNIFICANT CHANGES MAY REQUIRE A WRITTEN QUOTATION OF ADDITIONAL LABOR AND MATERIALS FROM THE TELECOMMUNICATIONS CONTRACTOR.
4. IT IS THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE TO BEAR THE ADDED COST OF ANY SUBSTANTIAL CABLING SYSTEM DESIGN CHANGES. THE CONTRACTOR WILL NOT PROCEED WITH ANY CHANGE ORDERS WITHOUT WRITTEN APPROVAL BY THE OWNER'S REPRESENTATIVE. ANY CHANGES NOT APPROVED BY THE OWNER'S REPRESENTATIVE WILL BE RESPONSIBILITY OF THE CONTRACTOR AND AT NO COST TO CITY OF MADISON .
5. FIELD CHANGES THAT ARE COMPLETED WITHOUT ISSUANCE OF REVISED DRAWINGS SHALL BE CLEARLY DENOTED ON THE WORKING AS-BUILT DRAWING. REFER TO "AS-BUILT DRAWINGS" ABOVE.

D. PUNCH LISTS AND CORRECTIVE ACTION

1. AS REQUIRED IN THE CONTRACT DOCUMENTS, THE TELECOMMUNICATIONS CONTRACTOR SHALL CORRECT PUNCH-LISTS ITEMS DETERMINED TO BE IN VIOLATION OF DRAWINGS, SPECIFICATIONS, CODES, STANDARDS OR REGULATIONS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TIMELY RE-WORK OF FAULTY CABLING OR HARDWARE INSTALLATIONS.
3. THE OWNER RESERVES THE RIGHT TO WITHHOLD FINAL PAYMENT UNTIL PUNCH LIST ITEMS ARE RESOLVED SATISFACTORILY.

1.13 WARRANTY

- A. THE CITY OF MADISON REQUIRES A PERMANENT LINK WARRANTY FOR THE PROJECT. MANUFACTURER REQUIRES PERMANENT LINK TEST.
- B. THE LENGTH OF THE EXTENDED WARRANTY SHALL BE A MINIMUM OF TWENTY-FIVE (25) YEARS.
- C. WARRANTY COVERING ALL COMPONENTS, EQUIPMENT AND WORKMANSHIP SHALL BE SUBMITTED IN WRITING WITH SYSTEM DOCUMENTATION.
- D. THE WARRANTY PERIOD SHALL BEGIN ON THE SYSTEM'S FIRST USE BY THE OWNER.
- E. SHOULD THE CABLING SYSTEM FAIL TO PERFORM ITS EXPECTED OPERATION WITHIN THIS WARRANTY PERIOD DUE TO INFERIOR OR FAULTY MATERIAL AND/OR WORKMANSHIP, THE CONTRACTOR SHALL PROMPTLY MAKE ALL REQUIRED CORRECTIONS WITHOUT COST TO THE OWNER
- F. UPON COMPLETION OF THE PROJECT THE TELECOMMUNICATION CONTRACTOR SHALL FORWARD THE SIGNED WARRANTY REGISTRATION FORM AND WARRANTY CERTIFICATE TO THE OWNER.
- G. THE MANUFACTURER WARRANTS CATEGORY 6 CABLING, OPTICAL FIBER CABLING AND CONNECTING COMPONENTS FREE OF DEFECTS IN MATERIAL OR WORKMANSHIP.

- H. CATEGORY 6 AND OPTICAL FIBER CABLING AND COMPONENTS ARE WARRANTED TO PERFORM THE INTENDED APPLICATION UPON COMPLETION OF PROPER INSTALLATION AND TESTING.
- I. WARRANTY COVERAGE INCLUDES APPLICATION ASSURANCE AND COMPLIANCE TO APPLICABLE PERFORMANCE SPECIFICATIONS.
- J. INSTALLED CATEGORY 6 CABLING SYSTEMS MAY BE GRANTED A FULL CHANNEL WARRANTY UNDER THE CONDITIONS STATED BELOW.
 - 1. A CERTIFIED INSTALLER REGISTERED WHO HAS COMPLETED A MANUFACTURER'S TRAINING PROGRAM PERFORMS THE CONSTRUCTION.
 - 2. CONTRACTORS PERFORMING THE CERTIFIED INSTALLATION ARE PROPERLY REGISTERED IN THE MANUFACTURER'S WARRANTY PROGRAM.
 - 3. THE CHANNEL COMPONENTS ARE SUPPLIED ENTIRELY BY ONE MANUFACTURER, INCLUDING PATCH CORDS.
 - 4. CABLE USED IN THE INSTALLATION IS QUALIFIED AND RECOGNIZED BY CONNECTIVITY MANUFACTURER.
 - 5. INSTALLED LINK SYSTEMS ARE PROPERLY DOCUMENTED AND TESTED WITH A "PASS" RESULT. THE COUNTY REQUIRES A LINK TEST AND THE USE OF MANUFACTURER PATCH CORDS TO RECEIVE A CHANNEL WARRANTY.
 - 6. FIELD TEST EQUIPMENT USED FOR CATEGORY 6 CABLING IS MINIMUM LEVEL III CLASSIFICATION, AND COMPLIES WITH TIA/EIA-568-B.2 REQUIREMENTS.
 - 7. REQUIRED TEST RESULTS, STORED ON A CD, AND PROJECT DOCUMENTATION INCLUDING AS-BUILT DRAWINGS, ARE SUBMITTED TO THE MANUFACTURER BY THE REGISTERED CONTRACTOR.

1.14 MOVES, ADDS AND CHANGES

- A. MOVES, ADDS AND CHANGES INITIATED BY THE OWNER, END USER, PROJECT MANAGER, OR DESIGN AGENT, WHICH ARE BEYOND THE SCOPE OF WORK IN THE ORIGINAL CONTRACT, SHALL REQUIRE A REVISED QUOTATION BY THE TELECOMMUNICATIONS CONTRACTOR.
- B. IT IS THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE TO BEAR THE ADDED COST OF ANY SUBSTANTIAL CABLING SYSTEM DESIGN CHANGES.
- C. MOVES, ADDS AND CHANGES SHALL EITHER BE ISSUED IN REVISED DRAWINGS, OR OTHERWISE SHALL BE CLEARLY DENOTED ON AS-BUILT DRAWINGS.
- D. MOVES, ADDS AND CHANGES THAT AFFECT INSTALLATIONS COVERED IN A MANUFACTURER'S WARRANTY SHALL BE PERFORMED BY A CERTIFIED CONTRACTOR THAT IS PROPERLY REGISTERED IN THE MANUFACTURER'S WARRANTY PROGRAM.

1.15 CLEANUP

- A. THE COMMUNICATIONS CONTRACTOR SHALL CLEAN UP ALL DEBRIS RELATED TO THIS WORK ON A REGULAR BASIS LEAVING THE JOB SITE IN A CLEAN, SAFE CONDITION.
- B. PROTECT ALL EQUIPMENT FROM DAMAGE DURING CONSTRUCTION. EQUIPMENT NOT PROTECTED SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

PART 2 - PRODUCTS

2.1 WORK AREA CONNECTORS

- A. CATEGORY 6 JACKS
 - 1. JACKS SHALL BE STANDARD 8-POSITION, RJ-45 STYLE, UN-KEYED, FCC COMPLIANT.
 - 2. JACKS SHALL BE DESIGNED FOR 4-PAIR, 100 OHM BALANCED UNSHIELDED TWISTED PAIR (UTP) CABLE.
 - 3. JACKS SHALL TERMINATE 26-22 AWG SOLID OR STRANDED CONDUCTORS.
 - 4. JACKS SHALL INCLUDE A DUST CAP FOR WIRE RETENTION.
 - 5. JACKS SHALL ACCEPT FCC COMPLIANT 6 POSITION PLUGS.

6. JACKS SHALL HAVE ATTACHED WIRING INSTRUCTION LABELS TO PERMIT EITHER T568A OR T568B WIRING CONFIGURATIONS.
7. CATEGORY 6 JACKS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY 3, 5, AND 5E CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
8. JACKS SHALL BE MANUFACTURED IN THE USA.
9. CATEGORY 6 JACKS SHALL MEET OR EXCEED CATEGORY 6 TRANSMISSION REQUIREMENTS FOR CONNECTING HARDWARE, AS SPECIFIED IN ANSI/TIA/EIA-568-C.2, TRANSMISSION PERFORMANCE SPECIFICATIONS FOR 4-PAIR 100 OHM
10. JACKS SHALL BE UL LISTED AND CSA CERTIFIED.
11. COLORS TO SPECIFIED BY END USER
12. CATEGORY 6 MODULAR JACKS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a HUBBELL
 - i. HXJ6EI (CATEGORY 6 - IVORY)

2.2 FACE PLATES

- A. REAR LOADING W/DESIGNATION WINDOW
 1. FACEPLATES SHALL BE CONSTRUCTED OF HIGH IMPACT, UL94 V-0 RATED THERMOPLASTIC.
 2. FACEPLATES SHALL BE COMPATIBLE WITH STANDARD NEMA OPENINGS AND BOXES.
 3. FACEPLATES SHALL BE 2.75" W X 4.5" H (69.8 MM X 114.3 MM) FOR SINGLE GANG AND 4.5" X 4.5" (114.3 X 114.3 MM) FOR DOUBLE GANG.
 4. PORT SIZE IN EACH FACEPLATE SHALL FIT THE CATEGORY 6 MODULAR JACK OR SNAP-FIT FIBER OPTIC, AUDIO, AND VIDEO MODULES FOR MULTIMEDIA APPLICATIONS.
 5. FACEPLATES SHALL BE PROVIDED WITH CLEAR PLASTIC AND COLOR-MATCHED LABEL FIELD COVERS. FACEPLATES SHALL PROVIDE FOR ANSI/TIA/EIA-606-A COMPLIANT WORKSTATION OUTLET LABELING.
 6. #6-32 PAN HEAD PHILLIPS/SLOTTED MOUNTING SCREWS SHALL BE INCLUDED WITH EACH FACEPLATE.
 7. FACEPLATES SHALL BE UL LISTED AND CSA CERTIFIED.
 8. WORK AREA FACEPLATES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a HUBBELL (IFP SERIES)
 - i. IFP14EI (4-PORT IVORY)

2.3 CABLE

- A. CATEGORY 6 UTP
 1. PLENUM - CABLE CONSTRUCTION SHALL BE FOUR TWISTED PAIRS OF 23 AWG INSULATED SOLID CONDUCTORS, WITH A RIPCORD, SURROUNDED BY A TIGHT OUTER JACKET.
 2. NON-PLENUM - CABLE CONSTRUCTION SHALL BE FOUR TWISTED PAIRS OF 24 AWG INSULATED SOLID CONDUCTORS, WITH A RIPCORD, SURROUNDED BY A TIGHT OUTER JACKET.
 3. NO MINIMUM COMPLIANT CABLE WILL BE ACCEPTED. THE FACILITY REQUIRES ADDITIONAL BANDWIDTH.
 4. RIPCORD SHALL BE DIRECTLY UNDERNEATH THE OUTER JACKET.
 5. CABLE SHALL BE MARKED WITH MANUFACTURER AND PERTINENT INFORMATION. UL, ETL, OR CSA AGENCY CERTIFICATION OR VERIFICATION MARKINGS SHALL BE MARKED ON THE CABLE JACKET ACCORDING TO THE CERTIFYING AGENCY'S REQUIREMENTS.

6. COLOR CODING OF THE PAIRS SHALL BE AS FOLLOWS:
 - a PAIR 1: WHITE/BLUE; BLUE
 - b PAIR 2: WHITE/ORANGE; ORANGE
 - c PAIR 3: WHITE/GREEN; GREEN
 - d PAIR 4: WHITE/BROWN; BROWN
7. PLENUM OR RISER RATED JACKETS
8. CABLE SHALL BE SUPPLIED IN 1000 FT SPOOLS OR 1000 FT REELEX BOXES.
9. CABLE SHALL EXCEED CATEGORY 6 TRANSMISSION REQUIREMENTS SPECIFIED IN ANSI/TIA/EIA-568-C.2.
10. CABLE SHALL BE UL AND C(UL) LISTED.
11. CABLE SHALL EXCEED THE REQUIREMENTS OF TIA/TSB-155: 10 GB/S ETHERNET OPERATION OVER 37 METERS CHANNEL LENGTH.
12. CATEGORY 6 UTP HORIZONTAL DISTRIBUTION CABLE, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a MOHAWK ADVANCENET CABLE
 - i. PLENUM M57193
 - ii. RISER M57202

B. BACKBONE DISTRIBUTION CABLE – FIBER OPTIC

1. SINGLEMODE FIBER BACKBONE DISTRIBUTION CABLE SHALL BE AVAILABLE IN MULTI-STRAND CONSTRUCTIONS FOR INTRABUILDING APPLICATIONS.
2. OFNR OR OFNP WILL BE DETERMINED AT EACH SITE. THE CONTRACTOR WILL BE RESPONSIBLE TO ASSURE THAT THE PROPER TYPE OF JACKETING IS BEING USED. FAILURE TO MEET THE LOCAL CODE WILL BE CAUSE FOR REPLACEMENT OF CABLE AT NO EXPENSE TO CITY OF MADISON.
3. SINGLEMODE FIBER SHALL BE DISPERSION UN-SHIFTED FIBER IN COMPLIANCE WITH ANSI/TIA/EIA-492CAAA.
4. INTRABUILDING FIBER DISTRIBUTION CABLE DESIGN SHALL BE ACCORDING TO ANSI/ICEA S-83-596.
5. SINGLEMODE BACKBONE FIBER DISTRIBUTION CABLE, WHEN INSTALLED, SHALL EXCEED THE PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.
6. SINGLEMODE OPTICAL FIBER BACKBONE FIBER DISTRIBUTION CABLE, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - a MOHAWK CABLE (BASIS OF DESIGN) OR EQUAL
 - i. SINGLEMODE RISER M9W042 (12 STRAND) – UNLESS OTHERWISE SPECIFIED BY THE CITY OF MADISON.
 - ii. SINGLEMODE PLENUM M9W048 (12 STRAND) - UNLESS OTHERWISE SPECIFIED BY THE CITY OF MADISON.

2.4 CONNECTORS – FIBER OPTIC

- A. PRE-POLISHED FIBER CONNECTOR BASIC DESIGN SHALL BE A FACTORY PRE-POLISHED LC-STYLE OPTICAL FIBER CONNECTOR WITH A ZIRCONIUM CERAMIC FERRULE.
- B. INDEX-MATCHING GEL IS FACTORY-INJECTED INTO THE CLEAVED FIBER STUB SPLICE TO MINIMIZE CONNECTOR INSERTION LOSS.
- C. LC SINGLEMODE FACTORY PRE-POLISHED CONNECTORS SHALL HAVE PRE-INSTALLED FIBERS.
- D. CONNECTOR MATERIALS SHALL BE DESIGNED WITH THERMAL STABILITY TO COMPLY WITH ENVIRONMENTAL REQUIREMENTS OF ANSI/TIA/EIA-568-B.3 AND TELCORDIA GR-1081-CORE.

- E. PRE-POLISHED LC CONNECTORS SHALL REQUIRE NO FIELD POLISHING AND REQUIRE NO ADHESIVES FOR TERMINATION.
- F. CONNECTOR DESIGN AND TERMINATION TECHNIQUE SHALL BE INDEPENDENT OF CABLE TYPE OR MANUFACTURER, AND SHALL BE COMPATIBLE FOR EITHER 900 MICRON BUFFER OR 250 MICRON BUFFER DISTRIBUTION CABLES.
- G. PRE-POLISHED LC FIBER CONNECTORS, WHEN PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL MEET THE 10 GB/S ETHERNET PERFORMANCE REQUIREMENTS OF IEEE802.3.
- H. LC FIBER CONNECTORS, PROPERLY INSTALLED ONTO QUALIFIED CABLE, SHALL EXCEED THE MECHANICAL AND ENVIRONMENTAL PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.3.
- I. MULTIMODE OPTICAL FIBER HORIZONTAL DISTRIBUTION CABLE, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE
 - 1. HUBBELL (PROCLICK)
 - a SINGLEMODE LC - FCLC900KSM12
 - 2. AFL (FAST)
 - a SINGLEMODE LC – FAST-LC-SM

2.5 PATCH PANELS – CATEGORY 6

- A. CATEGORY 6 PATCH PANELS SHALL BE STANDARD 8-POSITION, RJ-45 STYLE, UN-KEYED, FCC-COMPLIANT RECEPTACLE, IN 24- AND 48-PORT CONFIGURATIONS.
- B. PANEL FRAMES SHALL BE BLACK POWDER COATED 14-GAGE STEEL WITH ROLLED EDGES TOP AND BOTTOM FOR PROPER STIFFNESS.
- C. PANELS SHALL ACCOMMODATE A MINIMUM OF 24 PORTS FOR EACH RACK MOUNT UNIT (1 RMU = 1.75 IN.). 48 PORTS ARE RECOMMENDED.
- D. PANELS SHALL BE DESIGNED FOR 4-PAIR, 100 OHM BALANCED UNSHIELDED TWISTED PAIR (UTP) CABLE.
- E. PANELS SHALL TERMINATE 26-22 AWG SOLID CONDUCTORS.
- F. PANELS SHALL HAVE INDIVIDUAL PORT IDENTIFICATION NUMBERS ON THE FRONT AND REAR OF THE PANEL. PANELS SHALL HAVE THE CATEGORY 6 DESIGNATION, VISIBLE FROM THE FRONT WHEN INSTALLED.
- G. PRINTED CIRCUIT BOARDS SHALL BE FULLY ENCLOSED FRONT AND REAR FOR PHYSICAL PROTECTION.
- H. PANEL CONTACTS SHALL ACCEPT A MINIMUM OF 2000 MATING CYCLES WITHOUT DEGRADATION OF ELECTRICAL OR MECHANICAL PERFORMANCE.
- I. PANEL TERMINATION METHOD SHALL FOLLOW THE INDUSTRY STANDARD 110 IDC PUNCH-DOWN, USING A STANDARD 110 IMPACT TERMINATION TOOL.
- J. CATEGORY 6 PANELS SHALL BE BACKWARD COMPATIBLE WITH EXISTING CATEGORY 3, 5, AND 5E CABLING SYSTEMS FOR FIT, FORM, AND FUNCTION.
- K. CATEGORY 6 PATCH PANELS, WHEN INSTALLED, SHALL EXCEED THE LINK OR CHANNEL PERFORMANCE REQUIREMENTS OF ANSI/TIA/EIA-568-C.2.
- L. CATEGORY 6 PATCH PANELS SHALL BE ABLE TO ACCOMMODATE 10G IN A 37 METER CHANNEL PER TSB-155.
- M. CATEGORY 6 PATCH PANELS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - 1. HUBBELL (NEXTSPEED 6 SERIES)
 - a 24 PORT - P6E24U
 - b 48 PORT - P6E48U

2.6 RACKS – FREE STANDING – 2 POST

- A. RACK MATERIAL SHALL BE STRUCTURAL ALUMINUM WITH A DURABLE BLACK POLYURETHANE POWDER COAT FINISH.
- B. INSTALLED RACKS SHALL HAVE A STATIC LOAD CAPACITY OF 500 LBS.

- C. RACKS SHALL BE AVAILABLE IN EITHER 19-INCH OR 23-INCH STANDARD RACK CONFIGURATIONS.
- D. TAPPED HOLES IN THE VERTICAL RAILS FOR MOUNTING OF PANELS SHALL BE #12-24 THREAD SIZE. COATING SHALL NOT INTERFERE WITH THREAD FIT.
- E. STANDARD RACK HEIGHTS OF 7 FT (84 IN), AND HAVE A CAPACITY OF 45 RMU.
- F. RACK BASE ANGLES SHALL BE PRE-DRILLED FOR FLOOR MOUNTING, AND FOR ASSEMBLY TO VERTICAL RAILS.
- G. EACH RACK SHALL BE PROVIDED WITH, RACKS SHALL ACCOMMODATE EXPANSION OF CABLE CAPACITY AND ADDED VOLUME FOR CATEGORY 6 CABLING.
- H. *NOTE:* EACH BASIC RACK DELIVERED SHALL CONSIST OF: EQUIPMENT RACK, ISOLATION PADS, 18" WIDE BLACK LADDER RACK & MOUNTS TO SECURE TO RACK, A VERTICAL ELECTRICAL 20 AMP OUTLET STRIP (MINIMUM 6 RECEPTACALS) WITH MOUNTING BRACKETS.
- I. FREE STANDING RACKS AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - 1. HUBBELL (NEXTFRAME SERIES)
 - a. HPW84RR19

2.7 CABLE MANAGEMENT –VERTICAL CABLE MANAGEMENT

- A. Z-CHANNEL DESIGN OFFERS:
 - 1. AIRFLOW
 - 2. MINIMIZES WEIGHT
 - 3. MAXIMUM CABLE CAPACITY WITH UNOBSTRUCTED ACCESS TO CABLE
- B. SNAP IN SPOOLS WITH ABILITY TO PUT THEM WHERE THEY WILL DO THE MOST GOOD
- C. REAR CABLE MANAGEMENT ALLOWS CABLE TO BE RUN ON BOTH LEFT AND RIGHT SIDES, WHILE LEAVING THE AREA BEHIND THE ELECTRONICS AND PATCH PANELS OPEN FOR INCREASED AIRFLOW
- D. CONSTRUCTION:
 - 1. COLD ROLLED STEEL Z-CHANNELS
 - 2. COLD ROLLED STEEL COVERS
- E. MOUNTS TO 84" EQUIPMENT RACKS
- F. CHANNEL WIDTH: 6"W
- G. VERTICAL CABLE MANAGEMENT AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - 1. HUBBELL (NEXTFRAME SERIES)
 - a. VS76

2.8 CABLE MANAGEMENT – HORIZONTAL

- A. HORIZONTAL MANAGEMENT WILL BE CONSTRUCTED OF 14 GA COLD-ROLLED STEEL (CRS)
- B. FINISH SHALL BE A DURABLE, BLACK POWDER COAT.
- C. SIZE: 2RU
- D. FRONT RING DEPTH: 3.5"
- E. ALL STEEL CONSTRUCTION - RUGGED, NON-FLAMMABLE, NO FASTENERS TO WEAR OR BREAK, NO FINGERS TO FUSS WITH.
- F. MODULAR COMPONENTS EASILY CONFIGURED IN FIELD TO ADAPT TO DEMANDING APPLICATIONS.
- G. HINGED FRONT COVER - LOCKS IN PLACE WHEN COMPLETELY OPEN TO PREVENT COVER FROM BEING REMOVED OR LOST.
- H. HORIZONTAL CABLE MANAGEMENT AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:

1. HUBBELL (NEXTFRAME SERIES)

a HC219CE3N

I. ENCLOSURES – FIBER RACK MOUNT

1. RACK-MOUNTED, POWDER COATED FORMED COLD ROLLED STEEL ENCLOSURE.
2. SWING-OUT OR PULL-OUT INNER TRAY SHALL PROVIDE ACCESS TO INNER CABLES AND CONNECTIONS, AND MAINTAIN PROPER CABLE BEND RADIUS THROUGHOUT THE RANGE OF MOTION.
3. FIBER RACK-MOUNT ENCLOSURES SHALL BE A 19-INCH FORMED/WELDED AND POWDER COATED MODULAR DESIGN, SIZED ACCORDING TO THE CABLE INSTALLATION.
4. FIBER RACK-MOUNT ENCLOSURES MAY SERVE AS A MAIN, HORIZONTAL, OR INTERMEDIATE CROSS CONNECT FACILITY.
5. PANEL MOUNTING BRACKETS SHALL BE CONFIGURABLE TO EITHER 19" OR 23" RACKS PER ANSI/EIA-310-D.
6. ENCLOSURE CHASSIS SHALL HAVE TWO MOUNTING BRACKET LOCATIONS FOR EITHER FLUSH MOUNT OR CENTER MOUNT ON THE RACK.
7. INNER TRAY SHALL HAVE A THREADED MOUNTING BOSS TO ACCEPT A MOUNTING STUD FOR SPLICE TRAYS. SPLICE TRAY CAPACITY SHALL BE (2) 10" SPLICE TRAYS, EACH WITH 24-SPLICE CAPACITIES (48 SPLICES TOTAL). SPLICE TRAY MOUNTING BOSS SHALL ALSO ACCEPT A STUD FOR MOUNTING 1-RMU BLOWN FIBER ADAPTER BRACKETS.
8. INNER TRAY MOUNTING POSTS FOR MODULAR PANELS SHALL ALSO ACCEPT 12-FIBER MTP-STYLE CASSETTES FOR "PLUG & PLAY" INSTALLATIONS.
9. INNER TRAY SHALL HAVE REAR CABLE TIE-DOWN FEATURES TO ACCEPT VARIOUS DIAMETER BACKBONE CABLES ENTERING THE ENCLOSURE.
10. ENCLOSURES SHALL BE CONSTRUCTED OF 16 GAGE COLD ROLLED STEEL (CRS)
11. FIBER RACK-MOUNT ENCLOSURES AND ACCESSORIES, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a CLEARFIELD – FIELDSMART FIBER CROSSOVER DISTRIBUTION SYSTEM.

J. ADAPTER PANELS – OPTICAL FIBER

1. OPTICAL FIBER ADAPTER PANELS SHALL BE A MODULAR DESIGN POWDER COATED STAMPED METAL CONSTRUCTION.
2. ADAPTER PANELS SHALL BE LC.
3. HIGH OR LOW-DENSITY VERSIONS.
4. ADAPTER PANELS SHALL HAVE QUICK-RELEASE SNAP FASTENERS TO FIT DIRECTLY INTO FIBER ENCLOSURES.
5. FIBER PATCH PANELS, AS SPECIFIED IN THE CONTRACT DOCUMENTS, SHALL BE:
 - a CLEARFIELD – CLEARVIEW CLASS PATCH ONLY CASSETTE.

2.9 INNER-DUCT

1. FIBER OPTIC CABLE SHALL BE INSTALLED WITH INNERDUCT FOR PROTECTION OF FIBER CABLES IN A SHARED PATHWAY
2. THE INNER DUCT WILL BE RATED FOR THE ENVIRONMENT THAT IT IS BEING INSTALLED IN. PLENUM AND RISER RATED
3. THREE INNER DUCTS WILL BE RUN BETWEEN CLOSETS. ONE FOR CURRENT INSTALLATION, TWO SPARE FOR FUTURE APPLICATIONS.
4. SIZE: 1" CORRUGATED
5. FLEXIBLE & LIGHTWEIGHT FOR EASE OF HANDLING
6. PRE-THREADED WITH PULL LINE

PART 3 - EXECUTION

3.1 APPROVED CONTRACTOR RESPONSIBILITIES

- A. THE APPROVED CONTRACTOR SHALL ASSUME THE FOLLOWING RESPONSIBILITIES:
1. EXECUTE CONSTRUCTION IN ACCORDANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS.
 2. ADHERE TO PROJECT SCHEDULES AND JOB SITE RULES.
 3. ADHERE TO THE QUALITY, REGULATORY, LOGISTICS, AND DOCUMENTATION REQUIREMENTS.
 4. ADHERE TO THE PRODUCT REQUIREMENTS OUTLINED IN PART 2 ABOVE.
 5. ADHERE TO THE EXECUTION GUIDELINES OUTLINED BELOW.
 6. FURNISH THE CABLING SYSTEM CERTIFICATION AND WARRANTY PROVISIONS OUTLINED IN PART 4 BELOW.

3.2 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. MATERIALS DELIVERED TO THE CONSTRUCTION SITE SHALL BE STORED IN A DRY, SECURE AREA, PREFERABLY INDOORS. STORAGE TEMPERATURE OF MATERIALS SHALL ADHERE TO MANUFACTURER'S RECOMMENDATIONS. MOVEMENT OF PACKAGED MATERIALS SHALL BE IN A MANNER TO AVOID DAMAGE OF CONTENTS. ON-SITE STORAGE, EITHER INDOORS OR TRAILER, SHALL HAVE PERMISSION BY THE OWNER, AND SHALL NOT INTERFERE WITH OTHER CONSTRUCTION ACTIVITY.
- B. INSTALLATION OF CATEGORY 6 CABLE SHALL BE WITHIN THE RECOMMENDED TEMPERATURE RANGE SPECIFIED BY THE MANUFACTURER. CABLE INSTALLATION TEMPERATURE ABOVE 50F IS RECOMMENDED.

3.3 PREPARATION –

- A. CABLE PATHWAYS AND FIRESTOPS
1. CABLE PATHWAYS, INCLUDING CONDUIT, CABLE TRAY, LADDER RACK, RACEWAY, SLOTS, SLEEVES, ETC. SHALL BE LOCATED AND MOUNTED ACCORDING TO CONTRACT DRAWINGS AND MANUFACTURER'S INSTRUCTIONS. PATHWAYS SHALL NOT BE INSTALLED IN WET AREAS.
 2. CABLE PATHWAY FILL RATIO, BEND RADIUS, RUN LENGTH, NUMBER OF BENDS, AND PROXIMITY TO EMI SOURCES SHALL BE IN ACCORDANCE WITH ANSI/TIA/EIA-569-B. MAXIMUM CABLE COUNT OF THE INITIAL INSTALLATION SHALL NOT EXCEED 40% FILL RATIO IN ANY PATHWAY.
 3. IN ACCORDANCE WITH NEC 2005, POWER WIRING AND COMMUNICATIONS CABLING SHALL NOT SHARE THE SAME PATHWAY OR OUTLET UNLESS SEPARATED BY A PHYSICAL BARRIER.
 4. CABLE PATHWAYS SHALL BE SECURED TO A STRUCTURAL MEMBER OF THE BUILDING, OR PERMANENT WALL STUDS. WALL SURFACES FOR RACEWAY MOUNTING SHOULD BE FINISHED COMPLETE.
 5. METALLIC PATHWAYS SHALL BE ELECTRICALLY CONTINUOUS, FREE OF SHARP EDGES, AND PROPERLY BONDED TO AN APPROVED GROUND. EMI SOURCES SUCH AS BALLASTS, MOTORS, AND BUS CONDUCTORS SHALL BE AVOIDED BY USING PROPER SEPARATION DISTANCES.
 6. PATHWAYS THAT PENETRATE FIRE-RATED BARRIERS SHALL BE FIRE STOPPED ACCORDING TO LOCAL CODES AND RECOGNIZED PRACTICES. FIRE STOP MATERIALS OR DEVICES SHALL BE QUALIFIED TO UL-1479, IN ACCORDANCE WITH ASTM E814. FIRE STOP METHOD SHALL HAVE P.E. APPROVAL.
 7. CORE DRILLING OF HOLES FOR FIRE-RATED POKE-THROUGH OUTLET DEVICES SHALL HAVE APPROVAL BY A STRUCTURAL ENGINEER OR P.E. ON THE CONTRACT DRAWINGS PRIOR TO START OF WORK.
 8. PATHWAYS FOR VERTICAL CABLE RUNS, SUCH AS SLOTS AND SLEEVES, SHALL BE INSTALLED IN THE PROPER LOCATION IN ACCORDANCE WITH APPLICABLE CODES AND STANDARDS.
- B. TELECOMMUNICATIONS ROOMS AND EQUIPMENT ROOMS

1. TELECOMMUNICATIONS ROOM (TR) LAYOUT, LOCATION AND DESIGN SHALL BE IN ACCORDANCE WITH THE GUIDELINES OF ANSI/TIA/EIA-569-B. TR'S ON EACH FLOOR OF THE BUILDING SHOULD BE CENTRALLY LOCATED AND VERTICALLY ALIGNED TO SIMPLIFY BACKBONE CABLE AND PATHWAY ROUTING. TR'S SHALL NOT BE INSTALLED IN WET AREAS, OR NEAR EMI SOURCES OR CAUSTIC CHEMICALS.
 2. LAYOUT OF RACK, CABINET OR ENCLOSURE LOCATIONS SHALL BE ACCORDING TO CONTRACT DRAWINGS.
 3. RACKS AND CABINETS SHALL BE SECURED TO THE FLOOR USING PROPER ANCHORS AND FASTENERS.
 4. MOUNT AND ASSEMBLE RACKS, CABINETS, BRACKETS AND ENCLOSURES PER MANUFACTURER'S INSTRUCTIONS. MOUNT PATCH PANELS AND CABLE MANAGEMENT ACCESSORIES IN THE SPECIFIED LOCATIONS.
 5. ADJOINING PATHWAYS (LADDER RACK, CABLE TRAY, ETC.) SHALL BE PROPERLY SECURED AND POSITIONED TO ALLOW ADEQUATE BEND RADIUS OF CABLES ENTERING THE RACK OR CABINET.
- C. WALL OUTLETS AND RECESSED WALL BOXES
1. WALL OUTLET AND CABLE DROP PATHWAY LOCATION SHALL BE ACCORDING TO CONTRACT DRAWINGS. GUIDELINES FROM ANSI/TIA/EIA-569-B SHOULD BE FOLLOWED FOR LOCATION WITH ELECTRICAL OUTLETS AND OUTLET HEIGHT ABOVE FINISHED FLOOR.
 2. OUTLET BOXES SHALL BE FASTENED SECURELY TO A WALL STUD OR STRUCTURAL ELEMENT, IN A MANNER TO PERMIT FLUSH MOUNTING OF THE FACEPLATE WITH THE FINISHED WALL.
 3. MULTI-CONNECT BOXES SHALL BE INSTALLED IN A MANNER TO COMPLY WITH SEPARATION RULES FOR POWER AND COMMUNICATIONS WIRING IN CLOSE PROXIMITY.
 4. REFER TO SPECIFIC MANUFACTURER'S RECOMMENDATIONS FOR WALL OUTLET SELECTION, CABLE DEPLOYMENT, AND TERMINATION OF JACKS INTO FACEPLATES.
- D. SURFACE HOUSINGS AND MUTOA OUTLETS
1. RACEWAY OR CONDUIT SHOULD BE DEPLOYED TO THE SURFACE HOUSING LOCATION. FOR THROUGH-WALL CABLE ENTRY, CUT THE WALL OPENING TO MATCH THE OPENING IN THE HOUSING BASE.
 2. LAY OUT MOUNTING HOLES ONTO THE DESIRED WALL LOCATION. FOR WALLBOARD, CONCRETE OR CINDER BLOCK WALLS, DRILL TO THE PROPER DEPTH AND INSTALL ANCHORS.
 3. ALWAYS USE PROPER WALL ANCHORS. INSTALLING MOUNTING SCREWS DIRECTLY INTO WALLBOARD WITHOUT USING ANCHORS CAN CAUSE SCREW PULLOUT AND DETACHMENT OF THE SURFACE HOUSING. MOUNTING THE BASE PLATE TO STUDS IS RECOMMENDED.
 4. MOUNT BASE PLATE OF SURFACE BOX OR MUTOA TO OUTLET LOCATION USING PROPER FASTENERS. NOTE: FURNITURE AND WALL OUTLET APPLICATIONS REQUIRE MOUNTING OF BASE PLATE PRIOR TO CABLE PULLING AND CONNECTOR TERMINATION.
 5. INSTALL COVER ONTO BASE PLATE.
 6. REFER TO DETAILED MANUFACTURER'S GUIDELINES FOR CABLE DEPLOYMENT AND TERMINATION OF JACKS INTO SURFACE HOUSINGS. DUE TO THE LARGER SIZE OF CATEGORY 6 CABLES, PROPER CABLE BEND RADIUS MUST BE MAINTAINED. CERTAIN RESTRICTIONS MAY APPLY WHEN DRESSING CATEGORY 6 CABLING INTO SURFACE HOUSINGS.

3.4 INSTALLATION

A. CABLE SUPPORT

1. THIS CONTRACTOR SHALL INSTALL ALL SUPPORTS FOR CABLES SPECIFIED IN THIS SECTION. TRADITIONAL LADDER RACK WILL BE USED IN EACH

TELECOMMUNICATIONS ROOM, BASKET TRAY AND J-HOOKS WILL BE USED IN THE HORIZONTAL.

2. CABLE SUPPORTS SHALL BE SPACED RANDOMLY, BUT NO FURTHER THAN 5'-0" APART.
3. INNER-DUCTS WILL BE RUN BETWEEN EACH CLOSET OR TELECOMMUNICATIONS ROOM. ONE FOR CURRENT INSTALLATION WITH THREE MULTI CELLS FOR FUTURE INSTALLATIONS OR CHANGES. IN EACH TELECOMMUNICATIONS ROOM THE INNER-DUCTS ENTERING THE SPACE WILL BE COMBINED, IN A SIZE APPROPRIATE METALIC BOX THAT IS MOUNTED ON THE WALL. THE COMBINED INNERDUCTS WILL THEN BE ROUTED TO THE RACK AND THE FIBER BAY.
4. PROVIDE ALL ADDITIONAL CABLE MANAGEMENT PRODUCTS, SLEEVES OR CONDUIT RACEWAYS AS REQUIRED TO PROTECT EXPOSED CABLING AND COMPLETE THE INSTALLATION OF CABLES IN A NEAT MANNER.
5. A HORIZONTAL CONDUIT SYSTEM CONSISTS OF CONDUITS RADIATING FROM THE TELECOMMUNICATIONS ROOM TO THE WORKSTATION OUTLETS IN THE FLOOR, WALLS, CEILINGS, AND COLUMNS OF A BUILDING. WHEN USING A CONDUIT DISTRIBUTION SYSTEM UTILIZE THE MOST DIRECT ROUTE FOLLOWING THE BUILDING LINES.
6. THE SIZE AND NUMBER OF CONDUITS OR SLEEVES USED FOR BACKBONE PATHWAYS DEPENDS ON THE USABLE FLOOR SPACE SERVED BY THE BACKBONE SYSTEM. AT LEAST THREE 4 TRADE SIZE SLEEVES ARE RECOMMENDED.
7. CONDUIT IS ONLY REQUIRED IF BUILDING CODES OR ENVIRONMENTAL CONDITIONS NECESSITATE IT. RIGID OR EMT METAL CONDUITS ARE DEEMED SUITABLE FOR BUILDING INSTALLATION. ADEQUATE PLANNING SHOULD ALLOW FOR A MINIMUM OF ONE 1-INCH CONDUITS TO EACH WORKSTATION LOCATION IF CODE REQUIRES CONDUIT FOR VOICE AND DATA CABLES.
8. CONDUIT FILL RATIOS SHALL NOT EXCEED 40%; CONTACT YOUR CABLE MANUFACTURER TO GET RECOMMENDATION ON FILL RATES.
9. NO CONDUIT RUN SHOULD BE DESIGNED WITH MORE THAN TWO (2), 90 DEGREE BENDS BETWEEN PULL POINTS OR PULL BOXES. IF A RUN REQUIRES MORE THAN TWO 90 DEGREE BENDS, INSTALL A PULL BOX.
 - a EXCEPTIONS:
 - i. THE TOTAL RUN IS NOT LONGER THAN 33 FT.
 - ii. THE CONDUIT SIZE IS INCREASED TO THE NEXT TRADE SIZE.
 - iii. ONE OF THE BENDS IS LOCATED WITHIN 12 IN OF THE CABLE FEED END. (THIS EXCEPTION ONLY APPLIES TO PLACING OPERATIONS WHERE CABLE IS PUSHED AROUND THE FIRST BEND.)
10. ALL CONDUITS WILL BE EQUIPPED WITH A CONTIGUOUS LENGTH OF PLASTIC OR NYLON PULL STRING WITH A MINIMUM RATING OF 200 LBS. (90 KG)
11. A CONDUIT RUN SHOULD NOT BE DESIGNED WITH CONTINUOUS CLOSED SECTIONS LONGER THAN 100 FT WITHOUT PULL POINTS OR PULL BOXES INSTALLED.
12. ALL CONDUITS SHOULD TERMINATE ABOVE OR IN THE INSTALLED LADDER RACKS AND ALLOW FOR PROPER CABLE RACKING. CABLE WATERFALLS SHOULD BE CONSIDERED IN AREAS THAT HAVE EXCESSIVE DISTANCE BETWEEN THE CONDUIT AND LADDER RACK.
13. TRAYS AND CONDUITS LOCATED WITHIN THE CEILING SHALL PROTRUDE INTO THE ROOM A DISTANCE OF 1 TO 2 IN WITHOUT A BEND AND ABOVE 8 FT HIGH. CLEAR, UNOBSTRUCTED ACCESS TO THE LADDER RACK AND CONDUITS SHALL BE PROVIDED WITHIN TELECOMMUNICATIONS ROOMS.
14. CONDUITS ENTERING THROUGH THE FLOOR SHALL TERMINATE AT LEAST TWO (2) INCHES ABOVE THE FINISHED FLOOR
15. LOCATE SLOT/SLEEVE SYSTEMS IN PLACES WHERE PULLING AND TERMINATION WILL BE EASY.

16. IF POSSIBLE, LOCATE SLEEVES, SLOTS, AND/OR CONDUITS ON THE LEFT SIDE OF THE ROOM; THIS PLACEMENT ENHANCES THE USE OF WALL SPACE FROM LEFT TO RIGHT.
17. WHEN POSSIBLE, ENTRANCE CONDUIT AND DISTRIBUTION CONDUIT/CABLE TRAY SHOULD ENTER AND EXIT ON THE SAME WALL; IF THIS IS NOT POSSIBLE, LADDER RACK INSIDE THE ROOM SHOULD BE PROVIDED FOR DISTRIBUTION FROM WALL TO WALL.
18. ALL FLOOR PENETRATIONS SHALL BE CORE DRILLED WITH A MAXIMUM 1/4 INCH SIZE GREATER THAN THE EXTERIOR DIMENSION OF THE RISER CONDUIT
19. CONDUITS ENTERING THROUGH A WALL SHALL BE REAMED AND BUSHED, AND TERMINATED AS CLOSE AS PRACTICABLE TO THE TERMINATING RACK OR WALL
20. TERMINATING ABOVE A SUSPENDED CEILING MUST TERMINATE NOT LESS 3 INCHES ABOVE FINISHED CEILING AND FINISHED WITH BUSHING OPENING.
21. ALL CONDUIT WILL BE LABELED FOR EASY IDENTIFICATION
22. ALL FLOOR PENETRATIONS SHALL BE AT COLUMNS, EXTERIOR WALLS OR IN EQUIPMENT ROOMS.
23. CABLES SHALL BE SUPPORTED AT HEIGHT OF BOTTOM FLANGE OF STRUCTURAL BEAMS USING A RIGID SUPPORT METHOD (I.E. THREADED ROD, BEAM CLAMPS, ETC.)
24. DO NOT SUPPORT CABLES FROM DUCTWORK, SPRINKLER PIPING, WATER PIPING, WASTE PIPING, CONDUIT, CEILING WIRE, OR OTHER SYSTEM SUPPORTS.
25. THE CONDUITS OR SLEEVE WILL BE INSTALLED PER TIA/EIA-569-B AND SEAL ALL PENETRATION WITH APPROVED FIRE STOP PRODUCT.
26. PROVIDE INDEPENDENT SUPPORT SYSTEM FOR EACH LOW VOLTAGE CABLING SYSTEM.

B. CABLE:

1. CATEGORY 6 CABLE WILL BE RUN FOR DATA. CATEGORY 6 GELLED FILLED CABLE WILL BE RUN IN THE BACKBONE FOR ALL COMMUNICATIONS APPLICATIONS. CERTAIN ENVIRONMENTS MAY REQUIRE THE USE OF DIFFERENT CABLES AND/OR CABLE JACKETS.
2. **ALL TERMINATIONS WILL UTILIZE T568B WIRING IN THE CITY OF MADISON FACILITY .** ANY CONTRACTOR NOT COMPLYING WITH THIS WIRING REQUIREMENT WILL FIX THE PROBLEM AT NO COST TO CITY OF MADISON .
3. MAXIMUM CABLE LENGTHS TO BE 295 FEET (90 M) INCLUDING SERVICE LOOP. PROVIDE ALL NECESSARY INSTALLATION MATERIALS, TOOLS AND EQUIPMENT TO PERFORM INSULATION DISPLACEMENT TYPE TERMINATIONS AT ALL COMMUNICATIONS OUTLETS, PATCH PANELS.
4. ALL COMMUNICATIONS CABLING THAT HAS BECOME ABANDONED AS PART OF NEW RENOVATION PROJECTS, PREVIOUS RENOVATION PROJECTS, OR TEMPORARY COMMUNICATION CABLES USED DURING THE CONSTRUCTION PROCESS SHALL BE COMPLETELY REMOVED.
5. REFER TO DETAILED MANUFACTURER'S GUIDELINES FOR DEPLOYMENT OF CATEGORY 6 CABLE. CERTAIN RESTRICTIONS APPLY, AND SPECIFIC TECHNIQUES ARE RECOMMENDED.
6. ALL CABLING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS' WRITTEN BEND RADIUS AND PULLING TENSIONS. GENERAL INDUSTRY GUIDELINES RECOMMEND THE FOLLOWING BEND RADIUS AND PULLING TENSIONS:
 - a TENSILE LOADING ON A SINGLE 4-PAIR COPPER UTP CABLE SHALL NOT EXCEED 25 LBF.
 - b BEND RADIUS OF A SINGLE 4-PAIR COPPER UTP CABLE SHALL NOT EXCEED 4 TIMES THE DIAMETER OF THE CABLE.

- c BEND RADIUS OF MULTI-PAIR COPPER UTP AND OPTICAL FIBER CABLE SHALL NOT EXCEED 10 TIMES THE DIAMETER OF THE CABLE.
7. ALL CONDUITS AND CONDUIT SLEEVES SHALL HAVE BUSHINGS OR GROMMETS SHALL BE INSTALLED PRIOR TO THE INSTALLATION OF COMMUNICATIONS CABLES TO AVOID DAMAGE AND ABRASIONS TO CABLE SHEATHING AND INSULATION. IF BUSHINGS HAVE ARE INSTALLED BY THE ELECTRICAL CONTRACTOR, THE COMMUNICATIONS CABLING CONTRACT SHALL FURNISH AND INSTALL BUSHINGS PRIOR TO PULLING COMMUNICATIONS CABLING.
8. HORIZONTAL CABLE LENGTH FOR 4-PAIR COPPER UTP CABLES SHALL NOT EXCEED 295 FEET. PRIOR TO BIDDING AND INSTALLATION, THE CONTACTOR SHALL REVIEW THE DRAWINGS AND VERIFY NO CABLE RUN EXCEEDS 295 FEET AND NOTIFY THE COMMUNICATIONS DESIGNER OF CABLE RUNS THAT MAY EXCEED 295 FEET.
9. SPLICES ARE NOT PERMITTED IN ANY VOICE OR DATA CABLE UNLESS OTHER SPECIFIED OR SHOWN ON DRAWINGS.
10. AVOID PLACING COPPER CABLES NEAR SOURCES OF EXTREME HEAT (I.E. BOILERS, RADIATORS, HEAT COILS).
11. MAINTAIN CABLE TWISTS FOR ALL UTP CABLES. FOR TERMINATIONS CABLE SHEATHING SHALL BE STRIPPING BACK NO MORE THAN ½" BACK FROM TERMINATION POINT FOR ALL CATEGORY 6 CABLES.
12. ALL CABLES SHALL BE SUPPORTED BY CABLE TRAY, CABLE RUNWAY, OR J-HOOKS. WHEN LARGE QUANTITIES OF CABLES LEAVE TRAYS OR RUNWAYS, CABLES SHALL BE SUPPORTED BY DROP-OUTS OR CABLE SUPPORT HARDWARE MANUFACTURED SPECIFICALLY FOR THE PURPOSE OF SUPPORTING CABLES. J-HOOKS SHALL BE INSTALLED A MINIMUM OF EVERY 5 FEET AND CABLING SHALL MAINTAIN MINIMAL DEFLECTION AND STRAIN (LESS THAN 12" DEFLECTION). CABLES SHALL NOT BE SUPPORTED FROM CEILING GRID WIRES. CABLES SHALL NOT RUN ABOVE IRON JOISTS.
13. ALL CABLES SHALL BE SEPARATED AND BUNDLED INTO LIKE GROUPS.
14. SERVICE LOOPS SHALL BE PROVIDED AT BOTH ENDS OF INSTALLED HORIZONTAL AND BACKBONE CABLING. A 12" SERVICE LOOP SHALL BE INSTALLED IN THE CEILING SPACE NEAR WORKSTATION OUTLETS (EXCESSIVE CABLE SHALL NOT BE COILED IN OUTLET BOXES). A 10' SERVICE LOOP SHALL BE PROVIDED IN COMMUNICATION ROOMS AND SHALL BE INSTALLED TO ALLOW FOR FUTURE EQUIPMENT RACK/CABINET RELOCATIONS WITHOUT THE NEED TO RE-TERMINATE PATCH PANELS; THE 10' SERVICE LOOP SHALL BE NEATLY BUNDLED AND SECURED IN CEILING SPACE WITH LARGE D-RINGS OR PLACE IN CABLE TRAYS. CABLE SLACK AND SERVICE COILS SHALL BE STORED PROPERLY ABOVE THE CEILING OR UNDER THE ACCESS FLOOR. A "FIGURE-EIGHT" SERVICE LOOP IS RECOMMENDED FOR CATEGORY 6 CABLING TO REDUCE EMI COUPLING. LOOSE, RANDOM BUNDLING IS RECOMMENDED.
15. ANY CABLING INSTALLING IN EQUIPMENT ROOMS SHALL BE NEATLY PLACED IN CABLING TRAYS, CABLING RUNWAYS, OR HORIZONTAL AND VERTICAL RACK/CABINET CABLE MANAGERS
16. VELCRO STRAPS SHALL BE UTILIZED IN THE TR AND INSIDE TC ENCLOSURES FOR ALL CABLE BUNDLING. TIE WRAPS SHALL BE PROHIBITED IN THE TELECOMMUNICATION ROOMS.
17. SEPARATION: MAINTAIN THE FOLLOWING DISTANCES BETWEEN CABLES, OTHER SYSTEM CABLES AND OTHER BUILDING SYSTEMS:
- a ONE (1) FOOT FROM FLUORESCENT LIGHTS.
 - b ONE (1) FOOT FROM POWER CABLE IN PARALLEL
 - c ONE (1) FOOT FROM ELECTRICAL CONDUITS, OTHER SYSTEMS CABLES OR OTHER ELECTRICAL EQUIPMENT.
 - d FOUR (4) FEET FROM MOTORS AND TRANSFORMERS
 - e THREE (3) FEET FROM HOT WATER PIPING OR OTHER MECHANICAL EQUIPMENT.

- f TEN (10) FEET FROM BUS CONDUCTORS OR HIGH-CURRENT BRANCH CIRCUITS
 - g ALL LOW VOLTAGE CABLES SHALL BE RUN PARALLEL OR AT RIGHT ANGLES TO BUILDING STRUCTURAL FRAMEWORK. DO NOT RUN CABLES DIAGONALLY ACROSS CEILING SPACE WITHOUT WRITTEN AUTHORIZATION BY THE ARCHITECT'S ELECTRICAL ENGINEER OR CITY OF MADISON REPRESENTATIVE.
 - h COMMUNICATIONS CABLING THAT MUST CROSS POWER CABLES OR CONDUIT SHALL CROSS AT A 90-DEGREE ANGLE, AND SHALL NOT MAKE PHYSICAL CONTACT.
18. FIRE SEAL AROUND ALL CABLES RUNNING THROUGH RATED FLOORS AND WALLS. FIRESTOP ALL CABLES AND PATHWAYS THAT PENETRATE FIRE-RATED BARRIERS USING APPROVED METHODS AND ACCORDING TO LOCAL CODES.
 19. LEAVE SPARE PULL STRING WITH EVERY OUTLET INSTALLED.
 20. DO NOT INSTALL CABLE IN WET AREAS, OR IN PROXIMITY TO HOT WATER PIPES OR BOILERS.
 21. CABLE ENDS FOR TERMINATION SHALL BE CLEAN AND FREE FROM CRUSH MARKS, CUTS, OR KINKS LEFT FROM PULLING OPERATIONS. INSTALLED CABLE JACKETS SHALL HAVE NO ABRASIONS WITH EXPOSED CONDUCTOR INSULATION OR BARE COPPER "SHINERS". THE INSTALLER IS RESPONSIBLE TO REPLACE DAMAGED CABLES.
 22. BACKBONE CABLES SHALL BE INSTALLED AND BUNDLED SEPARATELY FROM HORIZONTAL DISTRIBUTION CABLES. BACKBONE AND HORIZONTAL CABLE BUNDLES SHALL BE LOOSE AND RANDOM.
 23. BACKBONE CABLES SPANNING MORE THAN THREE FLOORS SHALL BE SUPPORTED AT THE TOP OF THE CABLE RUN WITH A WIRE MESH GRIP AND ON ALTERNATING FLOORS, UNLESS OTHERWISE SPECIFIED BY LOCAL CODES OR MANUFACTURER'S GUIDELINES.
 24. VERTICAL RUNS OF BACKBONE CABLES ENTERING EACH TR SHALL BE SECURELY FASTENED ALONG A PROPERLY PREPARED WALL IN THE TR ON EACH FLOOR. USE OF CABLE LADDER IS RECOMMENDED.
- C. COMMUNICATIONS INFRASTRUCTURE
1. MAXIMUM CABLE LENGTHS TO BE 295 FEET (90 M) INCLUDING SERVICE LOOP. PROVIDE ALL NECESSARY INSTALLATION MATERIALS, TOOLS AND EQUIPMENT
 2. SUPPORT AND SECURE CABLES AT PATCH PANELS USING REAR CABLE MANAGEMENT BRACKET, SPOOLS OR MANAGEMENT DEVISE.
 3. CROSS-CONNECTS SHALL BE COMPLETED AS PER CONSTRUCTION SCHEDULE.
- D. OPTICAL FIBER CABLE:
1. INNER-DUCTS OF THE PROPER RATING WILL BE RUN BETWEEN EACH CLOSET.
 2. CABLES FOR DIRECT BURIAL, AERIAL, OR OTHER OUTSIDE APPLICATIONS SHALL BE DESIGNED SPECIFICALLY FOR THE INTENDED PURPOSE.
 3. ALL OPTICAL FIBER INSTALLATIONS SHALL BE INSTALLED USING OPEN CABLING METHODS. LIMIT CABLE-BENDING RADIUS TO 20 TIMES THE CABLE DIAMETER DURING INSTALLATION, AND 10 TIMES THE DIAMETER AFTER INSTALLATION. PROVIDE ALL REQUIRED TOOLS, MATERIALS, CONSUMABLES, AND EQUIPMENT NECESSARY FOR FIELD MOUNTING OF LC CONNECTORS.
 4. DO NOT EXCEED THE MAXIMUM PULL TENSION SPECIFIED BY THE CABLE MANUFACTURER. USE APPROPRIATE LUBRICANTS AS REQUIRED TO REDUCE PULLING FRICTION. AVOID KINKING AND TWISTING OF CABLES DURING INSTALLATION.
 5. LABEL EACH END OF EACH CABLE AS TO SOURCE AND DESTINATION. TERMINATE OPTICAL FIBERS IN CONSISTENT, CONSECUTIVE MANNER AT EACH END. PLACE ALL MATERIAL IN INNER-DUCT BETWEEN LABEL OPTICAL FIBER RACEWAY CABLE WITH YELLOW "CAUTION - OPTICAL FIBER CABLE" TAGS EVERY 10 FEET. LEAVE 10 FEET

OF SLACK AT EACH FIBER TERMINATION POINT. NEATLY COIL SLACK OPTICAL FIBER CABLE ON TOP OF RACK ABOVE OPTICAL FIBER PATCH PANEL ENCLOSURE AT EACH RACK LOCATION.

6. OPTICAL FIBER CABLE TERMINATIONS SHALL UTILIZE ENCLOSURES AND COMPONENTS IN QUANTITIES CONSISTENT WITH THE REQUIRED FIBER COUNTS AT EACH END OF EACH SEGMENT.
7. DURING OPTICAL FIBER CONNECTOR TERMINATION, VISUALLY INSPECT ALL TERMINATIONS WITH A 200 OR 400-POWER MICROSCOPE.
8. FOLLOW ALL OF THE CONNECTOR MANUFACTURER'S RECOMMENDATIONS.
9. UNACCEPTABLE FLAWS IN THE TERMINATIONS WILL INCLUDE, BUT NOT LIMITED TO, SCRATCHES, FULL OR PARTIAL CRACKS, BUBBLES, PITS, EPOXY RESIDUAL, DIRT, DUST, OIL, MOISTURE, GRINDING AND SANDING DEBRIS. THE ACCEPTABLE TERMINATION WILL SHOW A CONNECTOR TIP THAT IS FREE OF ALL IMPERFECTIONS IN 100% OF THE CORE AND 80% OF THE CLADDING. ALL UNACCEPTABLE CONNECTORS SHALL BE INSPECTED AFTER REWORK.
10. DURING INSTALLATION OF OPTICAL FIBER CABLE DO NOT ALLOW PULLING TENSION TO EXCEED CABLE MANUFACTURER'S SPECIFICATION FOR THE CABLE BEING INSTALLED. ONLY THE STRENGTH MEMBER OF THE CABLE SHALL BE SUBJECTED TO THE PULLING TENSION.
11. CLEAN ALL OPTICAL FIBER CONNECTOR TIPS PRIOR TO INSERTING THEM INTO MATTING RECEPACLES OR BULKHEADS. INSTALL ALL DUST COVERS
12. USING APPROVED METHODS, PULL CABLE INTO CONDUIT, OR PLACE INTO RACEWAY OR CABLE TRAY AS SPECIFIED. A PULL CORD (NYLON; 1/8" MINIMUM) SHALL BE CO-INSTALLED WITH ALL CABLE INSTALLED IN ANY CONDUIT.
13. WHERE CABLES ARE INSTALLED IN AIR RETURN PLENUM, RISER RATED CABLE SHALL BE INSTALLED IN METALLIC CONDUIT.
14. BACKBONE AND HORIZONTAL CABLES SHALL BE INSTALLED AND BUNDLED SEPARATELY IN ANY PATHWAY.
15. CABLES ABOVE CEILINGS OR BELOW ACCESS FLOORS SHALL BE INSTALLED IN CABLE TRAY OR OPEN-TOP CABLE HANGERS.
16. CABLE SLACK AND SERVICE COILS SHALL BE STORED PROPERLY ABOVE THE CEILING OR UNDER THE ACCESS FLOOR. PATHWAY FILL RATIO IN CONDUIT, TRAY, RACEWAY, ETC. SHALL NOT EXCEED 40% OF PATHWAY CROSS-SECTIONAL AREA.
17. A SERVICE COIL OF AT LEAST 1 METER IS RECOMMENDED WITHIN WORKSTATION OUTLETS, AND AT LEAST 2 METERS IS RECOMMENDED FOR TELECOMMUNICATIONS ENCLOSURES. MAIN TRUNK AND OSP CABLES SHALL ALSO HAVE A LARGE DIAMETER SERVICE COIL IN THE SPECIFIED LOCATION. .
18. RECOMMENDED MAXIMUM SPACING OF CABLE SUPPORTS ABOVE THE CEILING IS 60 IN.
19. BACKBONE CABLES SPANNING MORE THAN THREE FLOORS SHALL BE SECURELY ATTACHED AT THE TOP OF THE CABLE RUN WITH A WIRE MESH GRIP AND ON ALTERNATING FLOORS OR AS REQUIRED BY LOCAL CODES.
20. VERTICAL RUNS OF CABLE SHALL BE SUPPORTED TO MESSENGER STRAND, CABLE LADDER, OR OTHER APPROVED STRUCTURE TO SUPPORT THE WEIGHT OF THE CABLE. DO NOT EXCEED MAXIMUM CABLE VERTICAL RISE LIMITS.
21. CABLES THAT ARE DAMAGED DURING INSTALLATION SHALL BE REPLACED BY THE CONTRACTOR.

E. RACKS AND ENCLOSURES:

1. FREESTANDING EQUIPMENT RACKS AND ENCLOSURES SHALL BE PROTECTED FREE OF ALL DUST, DEBRIS AND OTHER ENVIRONMENTAL ELEMENTS DURING CONSTRUCTION UNTIL SUBSTANTIAL COMPLETION WALK-THROUGH.
2. EACH RACK, ENCLOSURE SHALL HAVE A DEDICATED #6 AWG GROUND WIRE TO A GROUNDING BUSBAR OR BUILDING GROUND AS DEFINED BY NEC.
3. SECURE RACKS AND ENCLOSURES TO FLOOR USING RACK INSTALLATION KIT.

F. CATEGORY 6 JACKS

1. REFER TO SPECIFIC MANUFACTURER'S GUIDELINES FOR TERMINATION OF JACKS AND DRESSING CATEGORY 6 CABLES INSIDE WALL OUTLETS AND SURFACE HOUSINGS. DUE TO THE LARGER SIZE OF CATEGORY 6 CABLE, SERVICE COILS IN OUTLET BOXES AND SURFACE HOUSINGS ARE NOT RECOMMENDED.
2. TERMINATE JACKS ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
3. ALL JACK WILL BE WIRED UTILIZING T568B.
4. TO ASSURE 10GBASE-T PERFORMANCE, MAINTAIN WIRING PAIR TWISTS AS CLOSE AS POSSIBLE TO THE POINT OF TERMINATION. ALSO MINIMIZE THE LENGTH OF EXPOSED PAIRS FROM THE JACKET TO THE IDC TERMINATION POINT DURING INSTALLATION.
5. THE LENGTH OF WIRING PAIR UN-TWIST IN EACH TERMINATION SHALL BE LESS THAN 0.5 INCHES (13 MM).
6. JACKS SHALL BE PROPERLY MOUNTED IN PLATES, FRAMES, OR HOUSINGS WITH DUST CAPS FULLY INSTALLED OVER IDC CONTACTS.
7. HORIZONTAL CABLES EXTENDING FROM MOUNTED JACKS SHALL MAINTAIN A MINIMUM BEND RADIUS OF AT LEAST 4 TIMES THE CABLE DIAMETER, UNLESS SPACE IS RESTRICTED. NOTE: REFER TO SPECIFIC MANUFACTURER'S RECOMMENDATIONS FOR RESTRICTED CABLE BEND RADIUS.
8. CABLE TERMINATIONS SHALL MINIMIZE TENSILE OR BENDING STRAIN ON IDC CONTACTS AFTER ASSEMBLY OF FACEPLATE OR HOUSING TO THE WALL OUTLET.

G. CATEGORY 6 PATCH PANELS

1. PROPERLY MOUNT PATCH PANELS INTO THE DESIGNATED RACK, CABINET, OR BRACKET LOCATIONS WITH THE #12-24 SCREWS PROVIDED.
2. TERMINATE CABLES BEHIND THE PATCH PANEL ACCORDING TO MANUFACTURER'S INSTRUCTIONS.
3. TO ASSURE PERFORMANCE, MAINTAIN WIRING PAIR TWISTS AS CLOSE AS POSSIBLE TO THE POINT OF TERMINATION. ALSO MINIMIZE THE LENGTH OF EXPOSED PAIRS FROM THE JACKET TO THE ICD TERMINATION POINT DURING INSTALLATION.
4. THE LENGTH OF WIRING PAIR UN-TWIST IN EACH TERMINATION SHALL BE LESS THAN 0.5 INCHES (13 MM), AND SHALL BE KEPT TO A MINIMUM.
5. EACH TERMINATED AND DRESSED CABLE SHALL BE MAINTAINED PERPENDICULAR TO THE REAR COVER USING THE RECOMMENDED CABLE MANAGEMENT HARDWARE.
6. HORIZONTAL OR BACKBONE CABLES EXTENDING FROM THE REAR PANEL TERMINATIONS SHALL MAINTAIN A MINIMUM BEND RADIUS OF AT LEAST 4 TIMES THE CABLE DIAMETER.
7. CABLE TERMINATIONS SHALL HAVE MINIMAL TENSILE OR BENDING STRAIN ON PANEL IDC CONTACTS IN EACH INSTALLED LOCATION.
8. PANELS SHALL BE PROPERLY LABELED ON THE FRONT AND BACK WITH THE CABLE NUMBER AND PORT CONNECTIONS FOR EACH PORT.

H. HARSH ENVIRONMENT HOUSING AND CONNECTIVITY

1. MOUNT CONNECTOR HOUSING FROM FRONT OF DEVICE, BUT INSTALL GASKET OR OPTIONAL PROTECTIVE CAP BEFORE MOUNTING CONNECTOR HOUSING INTO DEVICE.
2. SECURE CONNECTOR HOUSING TO DEVICE USING SUPPLIED PLASTIC NUT. TIGHTEN NUT WITH 6-7 INCH/POUNDS OF TORQUE.
3. ENSURE THAT MOUNTING SURFACE IS CLEAN AND FREE OF DEBRIS.
4. INSTALLING THE JACK INTO THE MOUNTED CONNECTOR HOUSING.

5. INSTALL THE TERMINATED JACK INTO THE MOUNTED CONNECTOR HOUSING BY TILTING THE JACK AND SECURING THE FIXED LATCH IN THE CONNECTOR OPENING. ROTATE THE JACK, SECURING THE SPRING LATCH.
 6. CLEAN AND REMOVE ANY OBSTRUCTIONS FROM THE SURFACE THAT THE WALL PLATE ASSEMBLY WILL BE INSTALLED AGAINST.
 7. PLACE WASHERS PROVIDED WITH HI IMPACT SERIES PLATES ONTO SCREWS. ALIGN RUBBER GASKET ON BACK SIDE OF PLATE PRIOR TO INSTALLING TO BOX/WALL BY PLACING SCREWS THROUGH PLATE AND RUBBER GASKET.
 8. SECURE THE WALL PLATE ASSEMBLY TO BOX/WALL BY TIGHTENING SCREWS WITH 5 INCH/POUNDS OF TORQUE.
 9. ATTACH PATCH CORDS AND FIELD TERM PLUG ASSEMBLIES (SOLD SEPARATELY) TO THE MOUNTED CONNECTOR
- I. OPTICAL FIBER CONNECTORS, HORIZONTAL AND BACKBONE
1. INSTALLED FIBER CONNECTORS SHALL HAVE PROPER CABLE SUPPORT, ROUTING AND STRAIN RELIEF.
 2. INSTALLED CONNECTORS SHALL BE INSPECTED 100% FOR POLISH QUALITY, AND CONTAMINATION.
 3. FUSION SPLICES FOR PIGTAIL CONNECTIONS SHALL BE PROTECTED IN A SUITABLE ENCLOSURE.
- J. GROUNDING AND BONDING SYSTEMS: BASIC GUIDELINES
1. TELECOMMUNICATIONS GROUNDING AND BONDING SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH NEC REQUIREMENTS, AND PER THE GUIDELINES OF ANSI J-STD-607-A.
 2. THE TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB) SHALL BE BONDED TO THE BUILDING MAIN ELECTRICAL SERVICE GROUND (GROUNDING ELECTRODE CONDUCTOR OR GEC), USING APPROVED LUGS OR EXOTHERMIC WELD METHODS. BONDING TO THE GEC OR TMGB WITH SHEET METAL SCREWS IS PROHIBITED.
 3. THE TELECOMMUNICATIONS BONDING BACKBONE SHALL BE A MINIMUM 6 AWG COPPER WIRE CONDUCTOR. A TELECOMMUNICATIONS GROUNDING BUSBAR (TGB) SHALL BE INSTALLED IN THE TR ON EACH FLOOR, AND SHALL BE BONDED TO THE TBB. ALL METAL RACKS, CABINETS, PATHWAY AND ENCLOSURES SHALL BE BONDED TO THE TGB.
 4. TELECOMMUNICATIONS EQUIPMENT SHALL BE GROUNDED ACCORDING TO MANUFACTURER'S INSTRUCTIONS AND IN ACCORDANCE WITH APPLICABLE CODES.
 5. ALL METALLIC PATHWAYS, INCLUDING CONDUIT, RACEWAY LADDER OR CABLE TRAYS SHALL BE ELECTRICALLY CONTINUOUS AND SHALL BE BONDED TO GROUND ON EACH END.
 6. OSP CABLE ENTERING THE BUILDING OR BACKBONE CABLES HAVING METAL SHEATHS SHALL HAVE ISOLATION PROTECTION. ISOLATION PROTECTORS SHALL BE BONDED TO THE TMGB.

3.5 LABELING

A. GENERAL:

1. **ALL LABELS SHALL BE PERMANENT, MACHINE GENERATED LABELS PRODUCED BY A LABELING MACHINE.** LABELS SHALL BE A PERMANENT POLYESTER MATERIAL CLEAR IN COLOR WITH LABEL LETTERING BLACK IN COLOR. NO HAND WRITTEN LABELS WILL BE ACCEPTED.
2. LABELING INFORMATION WILL BE REVIEWED AT PRE-INSTALL MEETING, AND THE OWNER SHALL APPROVE THE LABELING SCHEME PRIOR TO THE INSTALLATION OF ANY CABLING.
3. SURFACES SHALL BE CLEANED BEFORE ATTACHING LABELS. ALL LABELS SHALL BE ATTACHED FIRMLY AND VERTICALLY PLUMB ON EQUIPMENT, FACEPLATES, PATCH PANELS TERMINATION BLOCKS, ETC.

4. ALL LABELING OF CABLES, EQUIPMENT, AND COMPONENTS SHALL BE INCLUDED IN AS-BUILT DOCUMENTATION, FLOOR PLAN DRAWINGS, AND SCHEMATIC DEIGNS.
- B. CABLING
1. ALL STRUCTURED CABLES (HORIZONTAL AND BACKBONE) SHALL BE LABELED AT BOTH ENDS WITHIN 6" OF CABLE TERMINATION POINT. WHERE VOICE BACKBONE CABLES EXTEND BEHIND TERMINATION BLOCKS, CABLE LABELS SHALL BE PLACED AT A LOCATION ON THE CABLE WHERE THE LABELS ARE VISIBLE FROM THE FRONT OF THE TERMINATION BLOCKS.
 2. LABELS SHALL HAVE AN ADHESIVE BACKING AND SHALL WRAP COMPLETELY AROUND THE CIRCUMFERENCE OF THE CABLE JACKET. LABEL AND LETTERING SIZES SHALL BE OF APPROPRIATE SIZE IN REGARDS TO CABLE DIAMETER.
- C. EQUIPMENT RACKS, TERMINATION HARDWARE, AND FACEPLATES
1. LABELING SCHEME TO BE SPECIFIED BY OWNER.

3.6 TESTING

- A. .CATEGORY 6 CABLE TESTING
1. PERMANENT LINK TESTING SHALL BE COMPLETED ON ALL HORIZONTAL (STATION) CABLES. THE CONTRACTOR WILL BE RESPONSIBLE TO SUPPLY A CHANNELL WARRANTY, BUT CITY OF MADISON IS REQUIRING THAT THE CONTRACTOR SUPPLY ALL MANUFACTURER PATCH CORDS PER THE CONTRACT.
 2. CATEGORY 6 CABLING SYSTEMS SHALL BE TESTED AS AN INSTALLED HORIZONTAL PERMANENT LINK CONFIGURATION. JACKS AND FACEPLATES SHALL BE ASSEMBLED COMPLETE AND PROPERLY MOUNTED INTO OUTLET BOXES. PANELS SHALL BE TERMINATED COMPLETE AND FULLY DRESSED WITH PROPER CABLE MANAGEMENT
 3. ALL WIRING SHALL BE CERTIFIED TO MEET OR EXCEED THE SPECIFICATIONS AS SET FORTH IN TIA-568C FOR CATEGORY 6 REQUIREMENTS FOR PERMANENT LINK. ALL TEST WILL BE PERFORMED TO 250MHZ.
 4. FIELD TESTING SHALL INCLUDE THE FOLLOWING PARAMETERS FOR EACH PAIR OF EACH CABLE INSTALLED:
 - a NAME OF THE PERSON PERFORMING THE TEST.
 - b TEST EQUIPMENT MANUFACTURER AND MODEL NUMBER.
 - c CABLE I.D. THE TEST SHEETS WILL BE IN NUMERICAL ORDER BY CABLE ID.
 - d DATE OF TEST.
 - e WIRE MAP (PIN TO PIN CONNECTIVITY AND POLARITY CHECK)
 - f LENGTH (IN FEET)
 - g INSERTION LOSS.
 - h NEAR END CROSSTALK (NEXT).
 - i POWER SUM NEAR END CROSSTALK (PSNEXT).
 - j EQUAL-LEVEL FAR END CROSSTALK (ELFEXT).
 - k POWER SUM EQUAL-LEVEL FAR END CROSSTALK (PSELFEXT).
 - l RETURN LOSS.
 - m DELAY SKEW.
 - n ATTENUATION TO CROSSTALK RATIO (ACR).
 5. A "PASS" INDICATION SHALL BE OBTAINED FOR EACH LINK, USING AT MINIMUM A LEVEL III TESTER THAT COMPLIES WITH TIA/EIA-568-B.2 FIELD TEST REQUIREMENTS.
 6. RECORD TEST RESULTS FOR EACH CABLE AND TURN OVER TO THE GENERAL CONTRACTOR UPON COMPLETION OF THE JOB. CORRECT MALFUNCTIONS WHEN

DETECTED, AND RE-TEST TO DEMONSTRATE COMPLIANCE. NOTE: TEST EQUIPMENT SHALL BE A TYPE III CABLE TESTER.

B. OPTICAL FIBER TESTING:

1. TEST PROCEDURES SHALL BE AS DESCRIBED BY THE TIA/EIA-568-B: COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD, PARTS 2 AND 3 AND TIA/EIA-526-14-A-1998 - OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED MULTIMODE FIBER CABLE PLANT-OFSTP-14A
2. PREINSTALLATION TESTING:
 - a. TEST EACH CONDUCTOR OF EVERY OPTICAL FIBER CABLE ON THE REEL WITH A LIGHT SOURCE AND A POWER METER.
 - b. OBTAIN THE CABLE MANUFACTURER POWER METER TEST RESULTS FOR EACH REEL USED ON THE PROJECT. USING THE ATTACHED OPTICAL FIBER TEST FORM RECORD THE READINGS AND THE MANUFACTURER'S REEL NUMBER. PRIOR TO COMPLETION OF PROJECT, TURN OVER THE COMPLETED OPTICAL FIBER TEST FORM, OPTICAL FIBER CABLE REEL ID TAGS AND OPTICAL FIBER CABLE MANUFACTURER'S TEST RESULTS.
3. ACCEPTANCE TESTING:
4.
 - a. EACH TERMINATED FIBER STRAND IN THE HORIZONTAL OR BACKBONE INFRASTRUCTURE SHALL BE TESTED INDIVIDUALLY AS A PERMANENT LINK. A FIBER PERMANENT LINK IS DEFINED AS A LENGTH OF INDIVIDUAL FIBER STRAND WITH A CONNECTOR TERMINATED ON EACH END.
 - b. TESTING FOR MULTIMODE SHALL BE AT 850 AND 1300 NANOMETERS. TOTAL LINK INSERTION LOSS (DB) SHALL BE WITHIN THE SPECIFIED LINK LOSS BUDGET.
 - c. TIER 1 TESTING FOR EACH INSTALLED SINGLEMODE LINK SHALL BE PERFORMED AS AN OPTICAL POWER INSERTION LOSS MEASUREMENT, AS DEFINED BY ANSI/TIA/EIA-526-7. TESTING FOR SINGLEMODE SHALL BE AT 1310 AND 1550 NANOMETERS. TOTAL LINK INSERTION LOSS (DB) SHALL BE WITHIN THE SPECIFIED LINK LOSS BUDGET.
 - d. TIER 2 TESTING, IF REQUIRED FOR EACH INSTALLED SINGLEMODE OR MULTIMODE LINK, SHALL BE PERFORMED AS AN OTDR MEASUREMENT, AS DEFINED IN TIA-TSB-140. WE REQUIRE TIER 2 TESTING ON ALL FIBERS INSTALLED IN THE FACILITY FOR FUTURE TROUBLESHOOTING.
 - e. MULTIMODE OPTICAL FIBER ATTENUATION SHALL BE TESTED ON ALL INDIVIDUAL FIBERS OF EACH CABLE SEGMENT USING AN LED LIGHT SOURCE AND POWER METER TO DETERMINE THE ACTUAL LOSS. THESE TESTS SHALL BE PERFORMED AT THE 850NM AND 1300NM WINDOWS IN BOTH DIRECTIONS. TEST SET UP AND PERFORMANCE SHALL BE IN ACCORDANCE WITH ANSI/TIA/EIA-526-14A, METHOD B.
 - f. A REFERENCE POWER MEASUREMENT SHALL BE OBTAINED BY CONNECTING ONE END OF TEST JUMPER 1 TO THE LIGHT SOURCE AND THE OTHER END TO THE POWER METER. AFTER RECORDING THE REFERENCE POWER MEASUREMENT, TEST JUMPER 1 SHALL BE DISCONNECTED FROM THE POWER METER WITHOUT DISTURBING THE LIGHT SOURCE AND ATTACHED TO THE CABLE PLANT. THE POWER METER SHALL BE MOVED TO THE FAR END OF THE CABLE PLANT AND ATTACHED TO THE CABLE PLANT WITH TEST JUMPER 2.
 - g. READINGS MUST NOT BE HIGHER THAN THE "OPTIMAL ATTENUATION LOSS." THE OAL WILL BE CALCULATED USING THE MANUFACTURER'S FACTORY CERTIFIED TEST RESULTS, (DB/KM) CONVERTED TO THE ACTUAL INSTALLED LENGTHS PLUS THE MANUFACTURER'S BEST PUBLISHED ATTENUATION LOSSES FOR THE CONNECTOR AND/OR SPLICE INSTALLED ON THIS PROJECT. (0.30+/-0.30 FOR CONNECTORS AND 0.10 FOR SPLICES). THE CONSTRUCTION MANAGER SHALL USE THE OAL FOR COMPARISON WITH THE END TO END POWER LOSS TEST RESULTS PRIOR TO ACCEPTANCE.

- h TEST RESULTS: MUST BE COMPLETED AND TURNED OVER TO THE GENERAL CONTRACTOR PRIOR TO ACTIVE EQUIPMENT INSTALLATION. SPECIFIC DUE DATES FOR OPTICAL FIBER WILL BE ESTABLISHED AT PRE-INSTALL MEETING.

END OF SECTION

SECTION 28 31 00 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Furnish all labor, equipment, materials, and performing all operations in connection with the installation of the Fire Alarm System as shown on the drawings, as hereinafter specified, and as directed by the Engineer.
1. Expand the existing City-County Building addressable multiplexing fire alarm system with new addressable devices.
 2. The Contractor shall visit and inspect existing facility to determine extent of fire alarm work and to meet requirements of this specification and existing conditions.
- B. The Fire Alarm System shall consist of all necessary software, field wiring and equipment to perform all fire alarm, detection, and annunciation operations.
1. Annunciation per NFPA 72 and ADA.
- C. Fire Alarm Equipment shall Include:
1. Existing fire-alarm control panel.
 2. New notification appliances.
 3. Existing NAC power panels
 4. Existing digital alarm communicator transmitter.
- D. The Fire Alarm Sub-contractor shall be responsible for advising the Engineer ten(10) days prior to the bidding date of any omissions required to meet the local, state and federal requirements for the fire alarm installation. After this date, the additional requirements for a complete installation of the fire alarm system shall become the responsibility of the Fire Alarm Sub-contractor.
- E. The Fire Alarm Sub-contractor shall provide final fire alarm design responsibility for the project and submit all plans, plan approval fees, calculations and related to the City of Madison Fire Department to provide required approvals necessary to obtain facility occupancy for the Owner.

1.2 RELATED DOCUMENTS

- A. Applicable provisions of Division 1 shall govern work under this section.
- B. Specified Elsewhere:
1. 26 00 00 Electrical Systems

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. National Electric Code, Article 760.
 2. National Fire Protection Standards:
 - a. NFPA 71: Central Station Signaling Systems - Protected Premises Unit.
 - b. NFPA 72A: Local Protective Signaling Systems.
 - c. NFPA 72D: Protective Signaling Systems - Protected Premises Unit.
 - d. NFPA 72E: Automatic Fire Detectors.
 3. Local and state building codes.
 4. IBC.
 6. All requirements of the local authority having jurisdiction.

7. Underwriter's Laboratories: The system and all components shall be listed by Underwriters Laboratories, Inc. for use in fire protective signaling systems under the following standards as applicable.
 - a. UL 864: Control Units for Fire Protective Signaling Systems.
 - b. UL 464: Audible Signaling Appliances.
 - c. UL 1638: Visual Signaling Appliances.
 - d. UL 1481: Power Supplies for Fire Protective Signaling Systems.

- B. The equipment and installation supervision furnished under this specification is to be provided by a manufacturer (independent dealers and/or distributors will NOT be considered) who has been engaged in production of this type (software driven) of equipment for at least five (5) years, and has a fully-equipped service organization within one hundred and fifty (150) miles of the installation.
 1. All control equipment must have transient protection devices to comply with UL864 requirements.

- C. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

- D. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.

1.4 SUBMITTALS

- A. Submit in accordance with Division 1 and specified herein.

- B. Submit complete documentation showing the type, size, rating, style, catalog number, manufacturer's names, photos and or catalog data sheets for all items to ensure compliance with these specifications.

- C. Submit complete point to point wiring diagrams.

- D. All references to manufacturer's or supplier's model numbers and other pertinent information herein is intended to establish minimum standards for performance, function and quality. Equivalent equipment (compatible UL listed) from other manufacturers may be substituted for that specified providing the submittal is performed as specified above.

- E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
 1. Include voltage drop calculations for notification appliance circuits.
 2. Include battery-size calculations.
 3. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 4. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
 5. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

1.5 WARRANTY AGREEMENT

- A. The contractor shall warranty all materials, installation and workmanship for three (3) years from date of acceptance, unless otherwise specified. A copy of the manufacturers' warranty shall be provided with closeout documentation and included with the operation and installation manuals.
- B. Technical Support: Beginning with Substantial Completion, provide software support for three (3) years, shall be included in this project.

1.6 DELIVER, STORAGE AND HANDLING

- A. Deliver equipment individually wrapped in factory fabricated fiberboard type containers.
- B. Store equipment in clean, dry space.
- C. Protect from dirt, fumes, water and physical damage.
- D. Do not install damaged equipment, remove from site.

1.7 GENERAL

- A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans; to be wired, connected, and left in first class operating condition.
- B. The system shall use closed loop initiating device circuits with individual zone supervision, individual notification appliance circuit supervision, incoming and standby power supervision. Include a control panel, manual pull stations, automatic fire detectors, all wiring, connections to devices, outlet boxes, junction boxes, and all other necessary material for a complete operating system.

1.8 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Sprinkler system flow detection.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Activate the audio (speakers) and visual notification appliances.
 - 2. Identify alarm at fire-alarm control unit and remote annunciators.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Unlock electric door locks in designated egress paths.
 - 5. Release fire and smoke doors held open by magnetic door holders.
 - 6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 - 7. Record events in the system memory.
 - 8. Record events by the system printer.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
 - 1. Valve supervisory switch.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
 - 1. Retain only those devices and actions in subparagraphs below that are applicable to Project.
 - 2. Coordinate with requirements in other Sections that specify listed devices and systems.
 - 3. Open circuits, shorts, and grounds in designated circuits.

4. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 5. Loss of primary power at fire-alarm control unit.
 6. Ground or a single break in fire-alarm control unit internal circuits.
 7. Abnormal ac voltage at fire-alarm control unit.
 8. Break in standby battery circuitry.
 9. Failure of battery charging.
 10. Abnormal position of any switch at fire-alarm control unit or annunciator.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.
- F. General – Audio: Upon alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:
1. The internal audible device shall sound at the control panel or command center.
 2. The LCD Display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location and time/date.
 3. All system activity/events shall be documented on the system printer.
 4. Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.
 5. The following audio messages and actions shall occur simultaneously: An evacuation message shall be sounded for general alarm throughout the building. Owner to select tone and message for review by Dubuque Fire Marshall.
 6. Activate all visual strobes throughout the building. The visual strobe shall continue to flash until the system has been reset. The visual strobe shall not stop operating when the "Alarm Silence" is pressed.
 7. Provide selective paging to each individual floor (zone). In addition to the message/channels detailed above, a dedicated page channel shall be capable of simultaneously providing live voice instructions without interrupting any of the messages listed above shall be provided.
 8. Transmit signal to the central station.
 9. Activate automatic smoke control sequences.
 10. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
 11. All electrically locked stairwell/exit doors shall unlock throughout the building.
 12. All self-closing fire/smoke doors held open shall be released.

1.09 SUPERVISION

- A. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement conditions per circuit.

1.10 POWER REQUIREMENTS

- A. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of twenty-four (24)] hours with 10 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.
1. All circuits requiring system operating power shall be 24VDC and shall be individually fused at the control panel.

1.11 MULTIPLE ADDRESSABLE PERIPHERAL NETWORK

- A. Communication with addressable devices: The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:
 - 1. Alarm
 - 2. Trouble
 - 3. Open
 - 4. Short
 - 5. Ground
 - 6. Device Fail/or Incorrect Device
- B. All addressable devices are to have the capability of being disabled or enabled individually.
- C. Up to 127 addressable devices may be multi-dropped from a single pair of wires. Systems that require factory reprogramming to add or delete devices are unacceptable.
- F. Format: The communication format must be a poll/response protocol to allow t-tapping of the wire to addressable devices and be completely digital. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission protocol. Systems that do not utilize full digital transmission protocol (i.e. that may use time pulse width methods to transmit data etc.) will not be acceptable since they are considered unreliable and prone to errors.
- G. Identification of Addressable Devices: Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact.
- H. Wiring Type, Distances, Survivability and Configurations: Wiring types will be approved by the equipment manufacturer. Existing wiring will be utilized in retrofit applications. The system must allow up to 2,500 feet wire length to the furthest addressable device. Class A (Style 6 Signaling Line Circuit as defined by NFPA-72) communications will be provided where shown on the drawings. Wire will be so routed to maintain sufficient distance between the forward and return loop as called for by the Authority Having Jurisdiction (AHJ). To minimize wire routing and to facilitate future additions, t-tapping of the communications channel will be supported except where Class A wiring is required.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. EST by GE Security(Edwards).
- B. Simplex.
- C. Notifier.
- D. Radionics/Bosch 9000.

2.2 NOTIFICATION APPLIANCES

- A. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions.
- B. Any appliances, which do not meet the above requirements, and are submitted, for use must show written proof of they're compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers which clearly states that their equipment (as submitted) are

100% compatible with each other for the purposes intended. All appliances shall be UL listed Fire Protective Service. and shall be UL 1971.

C. Notification Appliances – Visual:

1. Provide wall or ceiling mounted white strobes with in-out screw terminals shall be provided for wiring. Strobes shall provide a smooth light distribution pattern field selectable candela 15 cd, 30 cd, 75 cd, and 110 cd flash output rating.
2. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting.
3. All strobes shall be synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules.
4. The strobes shall mount to one-gang electrical box. The device shall have plastic protective cover for during installation.
5. The actual candela setting on the visual shall be marked on the appliance.

D. Notification Appliance – Speakers:

1. Provide 4" white speakers at the locations shown on the drawings.
2. Speakers shall have a 4" mylar cone, paper cones are not acceptable.
3. The rear of the speakers shall be completely sealed protecting the cone during and after installation.
4. In and out screw terminals shall be provided for wiring.
5. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 25V or 70V systems.
6. At the 2 watt setting, the speaker shall provide a 90 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480.

E. Notification Appliance – Speaker/Strobes:

1. Provide 4" white speakers/strobes at the locations shown on the drawings.
2. Speakers shall have a 4" mylar cone, paper cones are not acceptable.
3. The rear of the speakers shall be completely sealed protecting the cone during and after installation.
4. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 25V or 70V systems.
5. At the 2 watt setting, the speaker shall provide a 87 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480.
6. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15/75cd, 30cd, 60, 75 & 110 cd devices.

2.3 GUARDS FOR PHYSICAL PROTECTION

- A. Provide welded mesh of size and shape for the manual pull stations, smoke detectors, notification appliances at location noted on the drawings.

2.4 INSPECTION BAR CODES

- A. Inspection bar codes shall be installed on all initiating devices, annunciators, control panels and power supplies.
- B. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of serial numbers. Serial number shall be printed below the bar code for identification purposes.

- C. Inspection bar codes shall be limited in size to no more than 2" (5cm) in width, and 3/8" (2 cm), in height and shall include a Mylar[®] or other protective coating to protect the bar code from fading due to sunlight or exposure.
- D. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12" from the device during inspection.

2.5 WIRE AND CABLE

- A. Signaling Line Circuits – Network Data: Twisted pair, not less than No. 18Awg or as recommended by the manufacturer.
- B. Signaling Line Circuits – Intelligent Loop: Twisted pair, not less than No. 18Awg or as recommended by the manufacturer.
 - 1. Circuit Integrity Cable: Provide as required to meet NFPA or Local Code requirements.
 - 2. CI Cable shall meet article 760, power limited fire alarm service.
- C. Notification Appliance Circuits –
 - 1. Audio and Visual. 12 AWG THHN or FPLP or as recommended by the manufacturer.
- D. All low voltage cable and wire shall be supplied and installed in accordance with the National Electrical Code and other provisions of Division 16000.
- E. Cable and wire selected for each application shall be in strict accordance with the original equipment manufacturers recommendations.
- F. All cables and wires shall be permanently tagged at both ends for ease in maintenance.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Notification Appliance Devices: Install between 80 and 96 inches on the wall.

3.2 CABLE WIRING

- A. Cable shall be the type listed for the use as specified under NEC Article 760-30 (bell wire, intercom, or telephone wire are not approved).
 - 1. All cable shall be installed as per NEC Article 760.
 - 2. Leave 8-inch wire tails at each device box and 36-inch wire tails at the Fire Alarm Control Panel.
 - 3. Cable for conventional initiating devices shall be looped by zone. Cable shall be installed from the Monitor Module to the first device, then to each succeeding device within each zone loop. An end-of-line resistor device shall be installed at or after the last device on the circuit.
 - 4. Cable for conventional indicating devices (audible or visual) shall be looped as stated above from the Control Module. An end-of-line resistor device shall be installed at or after the last device on the circuit. Wire may be 16 through 12 AWG.
 - 5. Cable for SLC loops shall be 18 to 12 AWG twisted pair with a shield jacket. Shield continuity must be maintained and connected to earth ground only at the control panel. Intelligent detector wiring must not be routed adjacent to, or in the same conduit with Audio/Visual power wiring, 120/240 VAC power wiring or other high current circuits.

6. T-Taps or branch circuit connections are allowed for all Style 4 intelligent loop circuits.
7. Cable for RS-232c devices (CRT, Printer) shall be dual pair twisted-shielded.
8. Power wiring shall be 12 AWG.

3.3 DEVICE BOX MOUNTING

- A. Device Box Mounting: Unless otherwise noted on the drawings, plans, specification or by the Engineer; the recommended mounting heights, type of boxes required and other specific requirements are as follows:
1. Signaling Device(s): Standard semi-flush horns, bells and chimes require a 4 inch square, 2-1/8 inch deep, device box with a 2-gang ring (1/2" minimum depth). Install 6" below finished ceiling or 120" maximum height.
 2. Where new devices are mounted at existing locations, provide painted back-up plates to provide a finished appearance.

3.4 FIELD QUALITY CONTROL

- A. All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.
- B. All wiring shall be tested for continuity, shorts, and grounds before the system is activated.
- C. All test equipment, instruments, tools and labor required to conduct the tests shall be made available by the installing contractor.
- D. The system including all its sequence of operations shall be demonstrated to the Owner, his representative, and the local fire inspector. In the event the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.
- E. At the final test and inspection, a factory trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.
- F. All fire alarm testing shall be in accordance with National Fire Alarm Code, NFPA 72 - 1999, Chapter 7.
- G. A letter from the Contractor certifying that the system is installed entirely in accordance with the system manufacturer's recommendations and within the limitations of the required listings and approvals, that all system hardware and software has been visually inspected and functionally tested by a manufacturer's certified representative, and that the system is in proper working order.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."
- B. Install framed instructions in a location visible from fire-alarm control unit.
- C. All initiating devices shall have bar code label installed visibly on the device. This bar code shall be used for digital inspection of the fire alarm system using Building Reports.Com.

3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.7 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by Architect, Engineer and authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections. Prepare test and inspection reports.
- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- H. Annual Test and Inspection: During the warranty period, each year test fire-alarm system complying with visual and testing inspection requirements in NFPA72. Use forms developed for initial tests and inspections.
- I. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Owner. Unless, the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicated a devices trouble. A copy of UL letter is to be provided as proof of system operation

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION E: BIDDERS ACKNOWLEDGEMENT

**CCB CITY CHANNEL REMODEL
CONTRACT NO. 7311**

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

CCB CITY CHANNEL REMODEL CONTRACT NO. 7311

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="padding-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="padding-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)

**CCB CITY CHANNEL REMODEL
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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:

CCB CITY CHANNEL REMODEL CONTRACT NO. 7311

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.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, on the day and year set forth below.

Seal

Principal

Date

By:

Name of Surety

By:

Date

This certifies that I have been duly licensed as an agent for the above company in Wisconsin under License No. _____ for the year _____, and appointed as attorney in fact with authority to execute this bid bond and the payment and performance bond referred to above, which power of attorney has not been revoked.

Date

Agent

Address

City, State and Zip Code

Telephone Number

NOTE TO SURETY & PRINCIPAL

The bid submitted which this bond guarantees shall be rejected if the following instrument is not attached to this bond:

Power of Attorney showing that the agent of Surety is currently authorized to execute bonds on behalf of the Surety, and in the amounts referenced above.

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:

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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.

**CCB CITY CHANNEL REMODEL
CONTRACT NO. 7311**

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	Mayor
Witness	Date
Witness	Date
Witness	Date
Witness	Date

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:

**CCB CITY CHANNEL REMODEL
CONTRACT NO. 7311**

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 journey person'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	<u>TOTAL</u>
<u>CODE</u>	<u>TRADE OR OCCUPATION</u>	\$	\$	\$
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 Loftzman; Add \$.75/hr for Sheet Piling Loftzman. 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, Dumptr, 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		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
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		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
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		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
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
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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

CODE	TRADE OR OCCUPATION	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 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 Waterproofofer	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 <u>All</u> Hours Worked				
CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
		\$	\$	\$
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 <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
	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 <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
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 <u>All</u> Hours Worked		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
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
CODE	TRADE OR OCCUPATION	\$	\$	\$
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	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	TOTAL
CODE	TRADE OR OCCUPATION	\$	\$	\$
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>	Fringe Benefits Must Be Paid On <u>All</u> Hours Worked		
		HOURLY BASIC RATE OF PAY	HOURLY FRINGE BENEFITS	TOTAL
		\$	\$	\$
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	Roofer 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.