BID OF_____

2012

PROPOSAL, CONTRACT, BOND AND SPECIFICATIONS

FOR

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3

CONTRACT NO. 6457

IN

MADISON, DANE COUNTY, WISCONSIN

AWARDED BY THE COMMON COUNCIL
MADISON, WISCONSIN ON_____

PLEASE RETURN PLANS AND SPECIFICATIONS TO:

CITY ENGINEERING DIVISION
1600 EMIL STREET
MADISON, WISCONSIN 53713

www.cityofmadison.com/business/pw

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

INDEX

SECTION A: ADVERTISEMENT FOR BIDS A-1

SECTION B: INSTRUCTIONS TO BIDDERS B-1

SECTION C: SBE C-1

SECTION D: SPECIAL PROVISIONS D-1

SECTION E: PROPOSAL E-1

SECTION F: BID BOND F-1

SECTION G: AGREEMENT G-1

SECTION H: PAYMENT AND PERFORMANCE BOND H-1

SECTION I: PREVAILING WAGE RATE I-1

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

SECTION A: ADVERTISEMENT FOR BIDS

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

A BEST VALUE CONTRACTING MUNICIPALITY

CONTRACT NO.	PROJECT NAME:
6457	madison police department training center-phase 3
SBE GOAL	12%

Plans and Specifications are available at 1600 Emil Street, Madison, WI 53713; 608-267-1197 or on our website at www.cityofmadison.com/business/pw/contracts/openforBid.cfm.

PREQUALIFICATIONS

Bidders who have not been prequalified by the City Engineer and Affirmative Action Director for the period of **February 1, 2012 to January 31, 2013** must submit their application on or before 1:00 p.m., AUGUST 10, 2012, Room 115, City-County Building, Madison, WI 53703. Postmark is not applicable. Contractors be prequalified by the City Engineer including an affirmative action plan approved by the Affirmative Action Director prior to the bid opening or the bid will be rejected. Forms are available at the same location or on our website at www.cityofmadison.com/business/pw/forms.cfm.

PRE-BID MEETING

Representatives of the Affirmative Action Department will be present to discuss the Small Business Enterprise requirements on JULY 27, 2012 at 1:00 PM at 1600 Emil Street, Madison Wisconsin.

PRE-BID WALK THRU

There will be a Pre-Bid Walk thru on Tuesday, July 24th, 2012 from 1:30 PM to 3:00 PM at at the Police Training Center located at 5702 Femrite Dr., Madison WI.

OTHER REQUIREMENTS

Sealed bids 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.

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

Deadline for the Submittal of Bid is AUGUST 10, 2012 by 1:00 PM, at 1600 Emil Street, Madison, WI 53713.

Bid Opening will be on AUGUST 17, 2012 at 1:30 PM at 1600 Emil Street, Madison, WI 53713.

REQUEST FOR BIDS FOR PUBLIC WORKS CONSTRUCTION FOR THE CITY OF MADISON, WISCONSIN

A BEST VALUE CONTRACTING MUNICIPALITY

Plans and Specifications for Public Works Projects that are open for bid are available on the City of Madison website at http://www.cityofmadison.com/business/PW/contracts/openforBid.cfm or by calling City Engineering at 608-266-4751.

Sealed bids 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.

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

Bidders must be prequalified with the City Engineer and the Affirmative Action Director. Deadline date for submittal of application is noticed on our website. Forms are available on the web at http://www.cityofmadison.com/business/pw/forms.cfm or by contacting City Engineering at 608-266-4620

Publ. WSJ 7/13, 7/20, 7/27, 8/3/12

SECTION B: INSTRUCTIONS TO BIDDERS

The City of Madison Standard Specifications for Public Works Construction - 2012 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 at www.cityofmadison.com/Business/PW/specs.cfm or by contacting City Engineering Division, Room 115, City-County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53703.

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 Madison 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 Madison General Ordinances (entitled Affirmative Action) and as required by Section 102.11 of the Standard Specifications.

Section 102.4: Proposals

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 musts 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 therefore 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. Proposals will be received at the place and until the hour on the date designated in the advertisement. When sent by mail, the sealed proposal marked as indicated above shall be enclosed in an additional envelope. Proposals sent by mail, submitted in person or otherwise delivered must be in the hands of the official conducting the letting by the hour on the date designated in the advertisement. Proposals received after the date designated will be returned to the bidder unopened.

The Bidder shall execute form ERD-7777 (R.9/03), a part of these proposal pages and submit same with the bidder's proposal, if applicable. REFER TO PROPOSAL SECTION.

Section 102.5: Bid Deposit (Proposal Guaranty)

No proposal shall be considered unless either (i) it is accompanied by a bid deposit of the character and amount described in the Advertisement for Bids or (ii) a biennial bid bond in an amount and form acceptable to the City of Madison has been previously submitted.

Bid deposits of unsuccessful bidders shall be returned following the award of the contract by the Common Council. Bid deposit of the successful bidders shall be returned within forty-eight (48) hours following execution of the contract and bond as required.

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. Concrete Work
221 ☐ Concrete Bases and Other Concrete Work
225 ☐ Dredging
230 ☐ Fencing
235 ☐ Fiber Optic Cable/Conduit Installation
240 ☐ Grading and Earthwork
242 ☐ Infrared Seamless Patching
245 ☐ Landscaping, Maintenance
250 ☐ Landscaping, Site and Street
251 ☐ Parking Ramp Maintenance
255 ☐ Pavement Sealcoating and Crack Sealing
260 ☐ Petroleum Above/Below Ground Storage Tank Removal/Installation
265 ☐ Retaining Walls, Precast Modular Units
270 ☐ Retaining Walls, Reinforced concrete
275 ☐ Sanitary, Storm Sewer & Water Main Const.
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
330 ☐ Traffic Control During Construction
320 ☐ Traffic Signals
325 ☐ Traffic Signing & Marking
335 ☐ Trucking
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
437 ☐ Metals
440 ☐ Painting and Wallcovering
445 ☐ Plumbing
450 ☐ Pump Repair
455 ☐ Pump Systems
460 ☐ Roofing and Moisture Protection
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: http://www.dhs.wisconsin.gov/Asbestos/Cert/Index.htm. State of Wisconsin Performance of Asbestos Abatement Certificate must be attached.

6 ☐ Other_____

SECTION C: SBE

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 commer¬cially 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 in a separate sealed envelope marked: **"ENVELOPE 2 - SBE COMPLIANCE REPORT."** 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-7; and
2.4.2.1.2 **Summary Sheet,** C-8.

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-7;
2.4.2.2.2 **Summary Sheet,** C-8; and
2.4.2.2.3 **SBE Contact Report,** C-9 and C-10. (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 deemed non-responsible for failure to demonstrate a good faith effort to achieve such goal and subsequently denied eligibility for award of contract may, within 72 hours of receiving such notification, appeal that decision to a special appeals committee composed of three (3) members of the Affirmative Action Commission, three (3) members of the Board of Public Works and a seventh member appointed by the Mayor. All appeals must be made in writing to the City Engineer and received within 72 hours of City of Madison's notice. Postmark not applicable.

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 with annual gross receipts of less than $750,000 when averaged over the past three year period;

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.

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

Small Business Enterprise Compliance Report

Cover Sheet

This information MUST be submitted in a separate sealed envelope marked "ENVELOPE NO. 2 - SBE COMPLIANCE REPORT."

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

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

Small Business Enterprise Compliance Report

Summary Sheet

This information MUST be submitted in a separate sealed envelope marked "ENVELOPE NO. 2 - SBE COMPLIANCE REPORT."

SBE SUBCONTRACTORS WHO ARE NOT SUPPLIERS

Name(s) of SBEs Utilized	Type of Work	% of Total Bid Amount

Subtotal SBE who are not suppliers: _____ %

SBE SUBCONTRACTORS WHO ARE SUPPLIERS

Name(s) of SBEs Utilized	Type of Work	% of Total Bid Amount

Subtotal Contractors who are suppliers: _____ % x 0.6 = _____ % (discounted to 60%)

Total Percentage of SBE Utilization: _____%.

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

Small Business Enterprise Compliance Report

SBE Contact Report

This information MUST be submitted in a separate sealed envelope marked "ENVELOPE NO. 2 - SBE COMPLIANCE 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

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

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: MINIMUM RATE OF WAGE SCALE

For this project, payment of prevailing wages (white sheet) is not required if either: a single trade accounts for 85% or more of the total labor costs of the project and the bid is less than $48,000; or no single trade accounts for 85% or more of the total labor costs of the project and the bid is less than $100,000. For bids not meeting either of these conditions, prevailing wages shall be required.

If 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 and Heavy Construction
- ☐ Sewer, Water, and Tunnel Construction
- ☐ Local Street and Miscellaneous Paving Operations
- ☐ Residential and Agricultural Construction

All bidders are notified that all labor employed on City contracts must be paid in accordance with the minimum rate of wage scale included in the Contract Documents.

For the information of the employees working on the project, a copy of the wage scale included in the contract documents and the provisions of Section 66.0903(8) of the Wisconsin Statutes shall be kept posted by the employer and in at least one conspicuous and easily accessible place at the site of the project.

The Contractor shall keep weekly payroll records setting forth the name, address, telephone number, classification, wage rate and fringe benefit package of each employee who worked on such City project and all other projects the employee worked in the same period, and the Contractor must 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. Such records shall, in addition, set forth the full weekly wages earned by each such employee and the actual hourly wage paid to that employee. The Contractor shall submit payroll records to the Engineer every week for those periods when work is being done on the project. Said submittal shall be within twenty-one (21) calendar days of the end of the Contractor's weekly pay period.

The Contractor shall ensure that employees shall be paid unconditionally and shall receive the full amounts accrued at the time of payment, computed at rates not less than those stated in the City of Madison "Minimum Rate of Wage Scale" and that 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 such employee. Questions regarding an employee's classification or rate of pay within that classification, shall

be resolved by the practice that predominates in the industry and on which the trade or occupation rate/classification is based. Therefore, rate of pay, classification and work jurisdiction disputes shall be resolved by relying upon practices established by collective bargaining agreements and guidelines used in such determinations by appropriate recognized trade unions operating within the City of Madison.

The Contractor shall agree that the normal rate of wage paid to the Contractor's employees on other projects shall not be reduced or otherwise diminished as a result of the requirement to pay no less than the minimum rate of wage scale on a City project. Mulcting of employees on City projects by contractors, such as by kickbacks or other such devices, is prohibited.

These contract provisions shall apply to all work performed on the contract by the Contractor with its own organization and with assistance of laborers under its immediate superintendency and to all work performed by piecework or by subcontract. No laborer, worker, or mechanic shall be employed directly upon the site of the work except on a wage basis, but this shall not be construed to prohibit the rental of equipment from individuals.

In the event of a refusal by the Contractor to submit payroll records as required by the contract, the City of Madison shall have the option to cancel this contract and request the Surety to perform or to relet the balance of the work for bids, and in that event, to charge the Contractor for any loss which the City may incur thereby.

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 $51,500 for a single trade contract; or equal to or greater than $251,000 for a multi-trade contract pursuant to MGO 33.07(7).

ARTICLE 102.3 EQUAL BENEFITS REQUIREMENT (SEC. 39.07, MGO)

This provision applies to contracts executed by the City on July 1, 2012 or later, unless exempt by Sec. 39.07 of the Madison General Ordinances (MGO).

For the duration of this Contract, the Contractor agrees to offer and provide benefits to employees with domestic partners that are equal to the benefits offered and provided to married employees with spouses, and to comply with all provisions of Sec. 39.07, MGO. If a benefit would be available to the spouse of a married employee, or to the employee based on his or her status as a spouse, the benefit shall also be made available to a domestic partner of an employee, or to the employee based on his or her status as a domestic partner. "Benefits" include any plan, program or policy provided or offered to employees as part of the employer's total compensation package, including but not limited to, bereavement leave, family medical leave, sick leave, health insurance or other health benefits, dental insurance or other dental benefits, disability insurance, life insurance, membership or membership discounts, moving expenses, pension and retirement benefits, and travel benefits.

Cash Equivalent. If after making a reasonable effort to provide an equal benefit for a domestic partner of an employee, the Contractor is unable to provide the benefit, the Contractor shall provide the employee with the cash equivalent of the benefit.

Proof of Domestic Partner Status. The Contractor may require an employee to provide proof of domestic partnership status as a prerequisite to providing the equal benefits. Any such requirement of proof shall comply with Sec. 39.07(4), MGO.

Notice Posting, Compliance. The Contractor shall post a notice informing all employees of the equal benefit requirements of this Contract, the complaint procedure, and agrees to produce records upon request of the City, as required by Sec. 39.07, MGO.

Subcontractors. Contractor shall require all subcontractors, the value of whose work exceeds the single-trade minimum set forth in Sec 33.07(7)(b)5., MGO, to provide equal benefits in compliance with Sec. 39.07, MGO.

See Section 39.07 MGO for exemptions from this requirement. Exemptions from this requirement include a Contractor whose employees are under a collective bargaining agreement that was in effect prior to July 1, 2012, however, the Contractor must agree to propose to the applicable collective bargaining unit(s) that an equal benefit requirement consistent with this ordinance be incorporated into the next collective bargaining agreement or in the existing agreement upon amendment, extension or other modification that occurs after July 1, 2012.

SECTION 105.1: AUTHORITY OF THE ENGINEER

The Engineer shall resolve all questions which arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the work, interpretation of the plans and Specifications, acceptable fulfillment of the contract, compensation, and disputes and mutual rights between Contractors under the Specifications. The Engineer shall determine the amount and quantity of work performed and materials furnished.

All decisions of the Engineer shall, when so requested, be rendered in writing. They shall be final and conclusive in all matters unless within ten (10) days after such decision the Contractor applies in writing to the Board of Public Works for a review of such decision.

Any change proposed by a Contractor in SBE subcontractors, vendors or suppliers from those SBEs indicated on the SBE Compliance Report must be approved by the Engineer and the City's Manager of the Affirmative Action Division (hereafter, AAD). When requested, such decision shall be rendered in writing. Such decisions shall be final and conclusive in all matters unless within ten (10) days after such decision the Contractor or the affected SBE applies in writing to the Board of Public Works for a review of such decision.

In the event the Engineer and the AAD disagree over the proper decision to be made regarding an SBE, the Mayor shall appoint a third person to resolve the disagreement, within 30 days of appointment. The decision thus rendered may be reviewed by the Board of Public Works upon request of the Contractor or the affected SBE as set forth in Sections 105.1 and 105.2 of the City's standard specifications.

SECTION 107.14 WEAPONS PROHIBITION

Contractor shall prohibit, and shall require its subcontractors to prohibit, its employees from carrying weapons, including concealed weapons, in the course of performance of work under this Contract, other than while at the Contractor's or subcontractor's own business premises. This requirement shall apply to vehicles used at any City work site and vehicles used to perform any work under this Contract, except vehicles that are an employee's "own motor vehicle" pursuant to Wis. Stat. sec. 175.60(15m).

COMPLETION DATE

Construction work must begin within seven (7) calendar days after the date appearing on the mailed START WORK LETTER. It is anticipated that the contractor can start work on or about October 8, 2012. The Contractor shall proceed with execution of this contract at a

rate so as to secure full completion **BEFORE APRIL 1, 2013**, the rate of progress and the time of completion being essential conditions of this agreement.

PRODUCT OPTIONS AND SUBSTITUTIONS

Materials and equipment for this project shall be from items specified or items approved as equal, in writing, by the Architect at least eight (8) days prior to bid receipt date.

Request for approval of materials or items of equipment as equal to that specified shall be submitted in writing from the General Contractor accompanied by data adequate to establish such equality and by citation of at least two (2) situations where such materials and/or items of equipment have been successfully used including references.

The Architect's decision as to quality or relative merit of item or substitution shall be final.

GENERAL INFORMATION

Obtain and pay for permits and fees required for this project.

Obtain and pay for construction sets of plans and specifications required for this project.

Attend the scheduled pre-bid walkthrough on site to become familiar with and verify existing job conditions.

Do not scale drawings for exact dimensions.

Work shall comply with applicable codes and regulations.

Schedule initial work with Randy Wiesner, City Engineering, Facility Management, at 267-8679, at least 48 hours in advance.

Contractor shall be responsible for restoring, repairing and/or replacing any materials, equipment or site damage caused by the work of this project to its original finish and/or condition.

Work shall be performed by mechanics skilled in the area of work included in this contract; shall be of professional quality; and shall be completed according to the best practice of the trade.

Workers shall be knowledgeable with regard to products used and shall take appropriate p recautions required to safeguard health and safety.

The intent of the plans and specifications is to provide for the construction, execution and completion of a complete work or improvements, which the contractor undertakes to do in full compliance with the plans, specifications, and contract. The Contractor shall perform all items of work covered and stipulated in the proposal and perform altered and extra work necessary to the prosecution and completion of the work.

The Contractor shall take no advantage of any apparent error or omission in the plans or specifications, and the Owner shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the plans and specifications.

Conditions of the Contract and Division I Specification Sections are applicable to all Divisions of the
Specifications and Drawings.

QUESTIONS

Questions pertaining to this project shall be directed to Adam Hertel at Angus Young Associates, 555 S. River Street, Janesville, WI 53548, 608-756-2326.

PROJECT SUMMARY

The project is to remodel tenant improvement space for the Madison Police Department Training Center located at 5702 Femrite Drive, Madison, Wisconsin. The area of the remodel is approximately 13,760 square feet.

The project is to complete the conversion of existing warehouse/manufacturing space into a state of the art training center for the Madison Police Department. This phase includes remodeling the existing building for an Auditorium, Computer Classroom, Defense and Tactics Training, Driver Simulation Training, Supply Room, additional restrooms, and similar spaces.

01200 SPECIAL PROJECT REQUIREMENTS

All work must be performed during the hours of 7:00a.m. and 6:00p.m. Monday through Friday.

On-site construction workers will be required to pass criminal background checks. Contractors and Sub-contractors shall provide the following information for all workers and staff having access to the contract area during the duration of this contract.

- Full name
- Date of birth
- Current address
- Current drivers license number (if any), include expiration date and state issuing the license

This information shall be submitted to CPT Tom Snyder or LT Melissa Schiferl on company letterhead on company letterhead at the preconstruction meeting. Contractors and Sub-contractors shall notify MPD of additions to the original list at least 24 hours prior to personnel entering the contract area. Additional time may be required if problems are encountered.

All construction work must be performed under full supervision of the Madison Police Department.



PROJECT MANUAL FOR

CoMadison Police Training Center - Phase 3
City of Madison
PROJ. #53W1393, CONTRACT#6457
5702 Femrite Drive
Madison, WI 53718

CoMadison Police Training Center - Phase 3
City of Madison
PROJ. #53W1393, CONTRACT#6457
5702 Femrite Drive
Madison, WI 53718

A/E Project No. 46453

ARCHITECT

Angus-Young Associates, Inc.
555 South River Street
Janesville, Wisconsin 53548-4783
608.756.2326
www.angusyoung.com

Angus Young
Balance in Creativity
Architecture
Engineering
Interior Design

SECTION 00 01 10
TABLE OF CONTENTS

CONTENTS

INTRODUCTORY PAGES

00 00 00	Cover Sheet
00 01 01	Project Title Page
00 01 10	Table of Contents

BIDDING REQUIREMENTS

All other Bid Requirements by City of Madison

CONDITIONS OF THE CONTRACT

By City of Madison

TECHNICAL SPECIFICATIONS

DIVISION 1:	**GENERAL REQUIREMENTS**
01 11 00	Summary of Work
01 23 00	Alternates
01 25 13	Product Substitution Procedures
01 31 19	Project Meetings
01 32 00	Construction Progress Documentation
01 32 13	Scheduling of Construction
01 33 00	Submittal Procedures
01 42 00	Reference Standards
01 45 00	Quality Control
01 50 00	Temporary Facilities and Controls
01 73 29	Cutting and Patching
01 74 00	Cleaning
01 74 19	Construction Waste Management
01 77 00	Closeout Procedures
01 78 13	Construction Verification Items
01 78 23	Operation and Maintenance Data
01 78 36	Warranties
01 78 39	Project Record Documents
01 79 00	Training and Demonstration
01 81 13	LEED Requirements
01 86 00	Functional Performance Testing
01 88 00	Indoor Air Quality During and After Construction
01 91 00	Commissioning Process

DIVISION 2:	**SITEWORK**
02 41 00	Selective Demolition

DIVISION 3:	**CONCRETE**
03 10 00	Concrete Forms and Accessories
03 20 00	Concrete Reinforcement
03 30 00	Cast-In-Place Concrete
03 39 23	Membrane Concrete Curing

DIVISION 4: **MASONRY**
04 05 13 Masonry Mortar
04 05 23 Masonry Accessories
04 22 00 Concrete Masonry Units

DIVISION 5: **METALS**
05 12 00 Structural Steel
05 45 00 Metal Support Assemblies
05 50 00 Metal Fabrications

DIVISION 6: **WOOD & PLASTICS**
06 10 00 Rough Carpentry
06 41 16 Plastic Laminate Casework and Countertops
06 60 00 Solid Polymer Fabrications

DIVISION 7: **THERMAL AND MOISTURE PROTECTION**
07 21 00 Vapor Retarders and Building Insulation
07 41 50 Metal Wall Panels
07 84 00 Firestopping

DIVISION 8: **DOORS AND WINDOWS**
08 11 00 Steel Doors and Frames
08 11 16 Aluminum Doors, Frames and Windows
08 14 00 Wood Doors
08 31 13 Access Doors and Frames
08 70 00 Finish Hardware
08 80 00 Glazing

DIVISION 9: **FINISHES**
09 29 00 Gypsum Board
09 30 00 Hard Tile
09 51 00 Acoustical Ceilings
09 65 00 Resilient Flooring
09 65 66 Athletic Flooring
09 68 00 Carpet
09 72 16 Vinyl Wall Covering
09 77 00 Fiberglass Reinforced Plastic (FRP) Panels
09 90 00 Paints and Coatings

DIVISION 10: **SPECIALTIES**
10 11 16 Markerboards
10 14 00 Interior Signage
10 21 13 Metal Toilet Compartments
10 22 26 Operable Partitions
10 26 00 Corner Guards
10 28 13 Toilet Accessories

DIVISION 11: **EQUIPMENT**
NOT USED

DIVISION 12: **FURNISHINGS**
12 21 00 Blinds

DIVISION 13: **SPECIAL CONSTRUCTION**
Not Used

DIVISION 14: **CONVEYING SYSTEMS**
Not Used

DIVISION 21: **FIRE PROTECTION**
21 00 01 Existing Fire Protection

DIVISION 22: **PLUMBING**
22 00 00 Mechanical & Plumbing Scope of Work
22 01 00 Mechanical & Plumbing General Provisions
22 02 00 Piping Pressure Test Report
22 07 00 Insulation
22 10 00 Plumbing

DIVISION 23: **HEATING, VENTILATION, AND AIR CONDITIONING**
23 00 00 Heating, Ventilation & Air Conditioning
23 05 93 Testing, Adjusting and Balancing
23 09 00 Controls & Instrumentation

DIVISION 26: **ELECTRICAL**
26 00 00 Existing Electrical Scope of Work
26 01 00 General Electrical Provisions
26 05 02 Minor Electrical Demolition for Remodeling
26 05 19 Conductors and Cables
26 05 26 Grounding System
26 05 33 Raceway and Boxes
26 05 53 Electrical Identification
26 09 00 Lighting Controls
26 27 26 Wiring Devices
26 28 18 Circuit Breakers
26 50 00 Lighting

DIVISION 27: **COMMUNICATIONS**
27 10 00 Communications Cable and Equipment
27 10 01 Commissioning Process for Communications Cabling and Equipment

DIVISION 28: **ELECTRONIC SAFETY AND SECURITY**
28 31 00 Fire Alarm System

DIVISION 31: **EARTHWORK**
Not Used

DIVISION 32: **EXTERIOR IMPROVEMENTS**
Not Used

DIVISION 33: **UTILITIES**
33 44 16 Prefabricated Utility Trench Drain System

END OF SECTION

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

A. For determining the Scope of the Work, this Section shall be used in conjunction with the Drawings and with corresponding Sections of the Technical Specifications, Conditions of the Contract, and issued Addenda. This Project is being bid as a single bid package.

B. Under this bid package, Contractor shall provide the necessary trades, for which bids are asked including, but not necessarily limited to, furnishing all labor, materials, tools, and equipment necessary for the construction of CoMadison Police Training Center - Phase 3 to be located at 5702 Femrite Drive in Madison, WI 53718.

C. Base Bid will include approximately 14,500 square feet of interior renovation. The Work which bids are asked includes, but is not necessarily limited to, saw cut and replace concrete, metal fabrication, steel erection, masonry, aluminum doors and interior hollow metal windows, wood doors, hollow metal door and frames, operable partitions, painting, metal wall panels, FRP, casework, carpet, rubber flooring, stained concrete floors, plastic toilet compartments, acoustical and moisture resistant ceilings, plumbing, mechanical, electrical, extending and some modification of fire sprinkler pipe and heads, and others. To assure proper coordination and completion of each bid package under this Project, the Contractor shall collaborate with all trades and material suppliers. The Contractor shall generate a single submittal log, submittal file in the Project trailer, and single construction schedule.

D. When successful bidders have been awarded the Contract, commencement and completion shall be as stated under the Instructions to Bidders and the Subcontractors Bid Form.

1.02 LEED REQUIRMENTS

A. The material, products and methods specified in this manual have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - Leed requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit EQ 4.1, EQ 4.2, EW 4.3 and EQ 4.4: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

B. Bidders should visit the Project site and acquaint themselves with all existing conditions. Bidders shall thoroughly photograph any extenuating conditions as a matter of record.

C. Temporary services shall comply with, but not limited to, the Special Conditions and Section 01 50 00. The Contractor shall coordinate temporary service connections with local utilities and all regulatory agencies.

D. The Owner reserves the right to contract separately other work not specifically stated in the Project Manual. The construction coordination shall adapt to the Work.

E. After final cleaning and upon written notice from the Contractor to the Architect that the Work is completed, the Architect will make a punch list of deficiencies and request their completion prior to final payment. Final payment will be made to the Contractor in accordance with the Conditions of the Contract. Upon completion of the Work, the Contractor shall remove from the Project site all material, tools and equipment belonging to him, and leave the Project site with an appearance acceptable to the Owner.

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. To enable the Owner to compare total costs where alternative areas, materials, and methods might be used, Alternates have been established as described on the Drawings and in this Section of these Specifications.

B. Related Work Described Elsewhere:

1. Materials and methods to be used in the Base Bid and in the Alternates have been described on the Drawings and in pertinent Sections of these Specifications.
2. Method for stating the proposed Contract Sum is described in the Bid Form.

1.02 SUBMITTALS

A. All Alternates described in this Section are required to be reflected in the appropriate section on the Bid Form as submitted by bidders.

1.03 PRODUCT HANDLING

A. If the Owner elects to proceed on the basis of one or more of the described Alternates, make all modifications to the Work required in furnishing and installing the selected Alternate or Alternates to the approval of the Architect/Engineer and at no additional cost to the Owner, other than as proposed on the Bid Form.

PART 2 - PRODUCTS

2.01 DEFINITIONS

A. The Base Bid for the Project shall, in general, include all of the work necessary to complete, as per Drawings and Specifications, the site and building Work. Alternate Bid prices shall also be based on complete areas and systems following all requirements of the Drawings and Specifications for all building Work.

2.02 ALTERNATES

A. Alternate A-1: Furnish and install vinyl wall covering in lieu of painted gypsum wall board as shown on drawings in Auditorium 115 and as specified in Section 09 72 16.

B. Alternate A-2: Furnish and install moisture resistant ceiling tiles and aluminum grid system as shown on drawings in Women's Restroom 107, Women's Lockers 108, Men's Restroom 109, and Men's Lockers 110 and as specified in Section 09 51 00. Also, relocate and reinstall conduit, fixtures, fire alarm devices, grilles, and fire sprinkler heads as shown on drawings and specifications.

C. Alternate A-3: The Owner has in their possession (12) 3' x 3' x ¾", (6) 5' x 5' x 7/8", and (11) +/- 3' long x 8" pieces of marble. Furnish and install Owner supplied marble as shown on drawings in Lobby 113 Kiosk, Break Area 118, and outside Restrooms 120 and 121 at the drinking fountains.

END OF SECTION

SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Product Options and Substitutions:

1. Materials and equipment for this project shall be from items specified or items approved as equal, in writing, by the Architect at least eight (8) days prior to bid receipt date.

   Request for approval of materials or items of equipment as equal to that specified shall be submitted in writing from the General Contractor accompanied by data adequate to establish such equality and by citation of at least two (2) situations where such materials and/or items of equipment have been successfully used including references.

   The Architect's decision as to quality or relative merit of item or substitution shall be final.

1.02 QUALITY ASSURANCE

A. Product Quality Equivalence:

1. Provide all information necessary as determined by the Architect/Engineer for adequate comparison of specified product to requested substitution.
2. All substitutions shall be of equal or better quality than the specified product as determined by the Architect/Engineer.

1.03 SUBMITTALS

A. Submit samples, manufacturer's literature, colors, etc., of both original product specified and requested substitution.

B. For equipment submittals, provide physical data including dimensions, weights etc., and a drawing or diagram demonstrating that the proposed substitution fits in the space provided and that the designed supports are adequate. Differences between the specified product and the proposed substitution must be clearly identified for the Architect/Engineer's review.

C. Where equipment substitutions include change in utility requirements such as a change in motor horsepower, the difference between the specified product and the proposed substitution must be clearly identified for the Architect/Engineer's review.

D. Provide cost comparison between specified product and requested substitution in equivalent terms and quantities.

E. Substitution approval does not relieve the Contractor from submitting shop drawings for the product. Make all submittals of shop drawings, samples, and other items, in strict accordance with Section 01 33 00 - "Submittal Procedures".

PART 2 - EXECUTION

2.01 INSTALLATION

A. Approved substituted products shall be installed using the same quality workmanship and manner as the originally specified product, per the manufacturer's recommendations, and shall be acceptable to the Architect/Engineer.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
   1. Pre-construction conference.
   2. Pre-installation conferences.
   3. Progress meetings.

1.03 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference before starting construction, at a time convenient to the Owner and the Architect, but no later than 15 days after execution of the Agreement. Hold the conference at the Project site or another convenient location. The Architect will conduct the meeting. The Contractor will review and present Contractor's responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:
   1. Introductions:
      a. Owner
      b. Architect
      c. Contractor
   2. Status of Contracts
   3. Permits and licenses
   4. Insurance
   5. Contractor information
      a. Schedule
      b. List of sub-contracts
      c. Insurance forms
   6. Request for payment procedure
   7. Change Order process
   8. Correspondence
   9. Orders and directions
   10. Meetings
   11. Submittals
   12. Record Drawings
   13. Existing facilities
   14. Owner's day-to-day schedule
   15. General cleaning
   16. Parking

a. Labor parking
b. Trailer

1.04 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the Project site before each construction activity that requires coordination with other construction.

B. Attendees: The Contractor, Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Shop drawings, product data, and quality-control samples.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities.
q. Space and access limitations.
r. Governing regulations.
s. Safety.
t. Inspecting and testing requirements.
u. Required performance results.
v. Recording requirements.
w. Protection.

2. Record significant discussions and agreements and disagreements of each conference, and the approved schedule.
3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.05 PROGRESS MEETINGS

A. Conduct progress meetings at the Project site at every 2 week intervals. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of

significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

D. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

1. Review the present and future needs of each entity present, including the following:Interface requirements.
    b. Time.
    c. Sequences.
    d. Status of submittals.
    e. Deliveries.
    f. Off-site fabrication problems.
    g. Access.
    h. Site utilization.
    i. Temporary facilities and services.
    j. Hours of work.
    k. Hazards and risks.
    l. Housekeeping.
    m. Quality and work standards.
    n. Change Orders.
    o. Documentation of information for payment requests.

E. Reporting: No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

F. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS

2.01 Not Used

PART 3 - EXECUTION

3.01 Not Used

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 GENERAL

A. Submittals: Submit the following:

1. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category (action or informational).
   d. Name of subcontractor.
   e. Description of the work covered.
   f. Scheduled date for Architect's final release or approval.

B. Contractor's Construction Schedule: Submit two printed copies of initial schedule large enough to show entire schedule for entire construction period.

C. Daily Construction Reports: Submit two copies at monthly intervals.

D. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

E. Coordination: Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, submittals schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

A. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

B. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

C. Submit within seven days after Award of Contract.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Submit a comprehensive, fully developed, horizontal Gantt-chart-type Contractor's Construction Schedule within twenty-one days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

C. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in ten percent increments within time bar.

D. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early or late completion date, unless specifically authorized by Change Order.

E. Activities: Treat separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than twenty days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Tabulation:
    a. Furnish a tabulation of each activity. Show the following information as a minimum for each activity:
        i. Preceding and following event numbers.
        ii. Activity description.
        iii. Estimated duration of activities.
        iv. Earliest start date (by calendar date).
        v. Earliest finish date (by calendar date).
        vi. Latest start date (by calendar date).
        vii. Latest finish date (by calendar date).
        viii. Slack or float (in calendar days).
4. Submittal Review Time: Include review and re-submittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
5. Startup and Testing Time: Include the number of days for startup and testing.
6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
7. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
    a. Phasing: Arrange list of activities on schedule by phase.
    b. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
    c. Work Restrictions: Show the effect on the schedule of limitations of continued occupancies, uninterruptible services, use of premises restrictions, and provisions for future construction.
    d. Work Stages: Indicate important stages of construction for each major portion of the Work.
    e. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, interim milestones, Substantial Completion, and Final Completion.
8. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

F. Daily Construction Reports: Prepare a daily construction report recording events at Project site, including list of subcontractors; high and low temperatures and general weather conditions; accidents; stoppages, delays, shortages, and losses; meter readings; orders and requests of authorities having jurisdiction; and equipment or system tests and start ups.

G. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate actual completion percentage for each activity.
4. Distribution: Distribute copies of schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
    a. Post copies in Project meeting rooms and temporary field offices.
    b. When revisions are made, distribute updated schedules to the same parties and post in the same locations.

END OF SECTION

SECTION 01 32 13
SCHEDULING OF CONSTRUCTION

PART 1 - GENERAL

1.01 SUMMARY

A. To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Architect in appraising the reasonableness of the proposed schedule and in evaluating progress of the work, prepare a manpower loading chart.

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. Requirements for Progress Schedule: Refer to General Conditions.
3. Construction Period: Refer to Form of Agreement.

C. Definitions:

1. "Day," as used throughout the Contract unless otherwise stated, means "calendar day."

1.02 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00.

B. Preliminary Man-loading Chart: Prior to construction start, General Contractor shall submit a manloading chart by crafts for duration of Contract.

C. Man-loading Chart: Within 10 calendar days after receipt of Notice to Proceed, submit one reproducible copy of the manloading chart prepared in accordance with Article 3.1 below.

D. Revised Analysis: Within ten calendar days after receipt of the Architect's review comments, submit one reproducible copy of the network analysis revised in accordance with those comments.

E. Periodic Reports: On the first working day of each month, the General Contractor shall submit a 3-month manpower loading chart by craft and major work item to the Owner and Architect.

1.03 QUALITY ASSURANCE

A. Perform data preparation, analysis, charting, and updating in accordance with pertinent recommendations contained in current edition of "CPM In Construction" manual of the Associated General Contractors.

PART 2 - PRODUCTS

2.01 MANLOADING CHART

A. Diagram:

1. Graphically show the order and interdependence of all activities necessary to complete the Work, and the sequence in which each such activity is planned to be accomplished, as planned by each contractor and their project field superintendents in coordination with all subcontractors and materials suppliers whose work is shown on the diagram.
2. Include, but do not necessarily limit to, indicated activities for:
   a. Project mobilization;
   b. Submittal and approval of shop drawings;
   c. Procurement of equipment and critical materials;

d. Fabrication of special equipment and material, and its installation and testing;
e. Final cleanup;
f. Final inspecting and testing; and
g. All activities of the Owner and the Architect which affects progress and/or affect required dates for completion of all or part of the Work.

3. Show information in such detail that duration times of activities will range normally from one to 15 calendar days.
4. Show on the diagram, as a minimum for each activity, preceding and following event numbers, description of each activity, cost, and activity duration in calendar days.

B. Tabulation:
1. Furnish a tabulation of each activity. Show the following information as a minimum for each activity:
a. Preceding and following event numbers.
b. Activity description.
c. Estimated duration of activities.
d. Earliest start date (by calendar date).
e. Earliest finish date (by calendar date).
f. Latest start date (by calendar date).
g. Latest finish date (by calendar date).
h. Slack or float (in calendar days).

PART 3 - EXECUTION

3.01 MANLOADING CHART

A. Submit in accordance with Article 1.02 above.

3.02 REVISIONS TO APPROVED SCHEDULE

A. Method:
1. Following approval of the schedule, if the Contractor desires to make changes in his method of operating and scheduling, they shall so notify the Architect in writing their reasons.
2. If the Architect considers these changes to be of a major nature, he may require the Contractor to revise and submit for approval, without additional cost to the Owner, all of the affected portions of the detailed diagrams and summary diagram to show the impact on the entire Work.

B. Major Change:
1. A change may be considered of a major nature if the time estimated to be required or actually used for an activity, or the logic of sequence of activities, is varied from the original plan to a degree that the Architect has reasonable doubt as to completion of the Work within the Contract Time.
2. Changes which affect activities with adequate slack time shall be considered a major change when their cumulative effect may affect the Contract completion date.

3.03 PERIODIC REPORTS

A. Contents:
1. Report actual progress by updating the manloading chart.
2. Note on the summary chart, or clearly show on a revised chart issued of affected portions of the detailed chart, all revisions causing changes in the detailed chart.
3. Revise the summary chart as necessary for clarity.

4. Activities or portions of activities completed during the reporting period, and their total value as basis for Contractor's periodic request for payment. Payment made pursuant to the Agreement may, when the Architect so directs, be based on the total value of such activities completed or partially completed after verification.
5. State the percentage of the Work actually completed and scheduled as of the report date, and the progress along the critical path in terms of days ahead of or behind the allowable dates.
6. If the work is behind schedule, also report progress along other paths with negative slack.
7. Include written narrative report which shows, but is not necessarily limited to:
    a. A description of problem areas, anticipated and current;
    b. Delaying factors and their impact;
    c. An explanation of corrective actions taken or proposed.
8. Show the date of latest revision.

B. Submit in accordance with Article 1.02 above.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined by manufacturer's name and catalog number, reference to recognized industry and government standards, or description of required attributes and performance. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advanced submittal of design data and its review by the Architect/Engineer. Make all submittals in strict accordance with the procedures defined in this Section.

B. Related Sections

1. Individual requirements for submittals are described in the pertinent sections of these Technical Specifications.
2. Supplementary Conditions.
3. Division 1 Section – Warranties
4. Division 1 Section – Operation and Maintenance Data

C. LEED Submittals:

1. Credit MR4.1 and MR4.2: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5.1 and MR 5.2: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
3. Credit EQ 4.1, EQ 4.2, EQ 4.3, and EQ 4.4: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.02 SUBMITTAL REQUIREMENTS

A. Make all submittals required by the Contract Documents, revise, and re-submit as necessary to establish compliance with the specified requirements.

B. Each submittal shall contain the number of copies which are required to be returned, plus three copies which will be retained by the Architect/Engineer unless indicated otherwise in other portions of this section.

C. Component Submittals

1. All items not specifically designed by the Architect/Engineer shall be considered components.
2. Local, state, and federal acceptance of component design is mandatory prior to fabrication and installation of components.
3. Component submittals shall conform to the requirements of all submittals and shall have the additional requirements of this section.
4. Preliminary and Final component submittals shall be made for all components.
5. Preliminary Component Submittals
   a. Each preliminary component submittal shall contain the number of copies which are required to be returned, plus three copies which will be retained by the Architect/Engineer.
   b. Include required design criteria and design calculations.

6. Final Component Submittals
    a. Each final component submittal shall contain three copies which will be retained by the Architect/Engineer.
    b. Include review fees required by local, state, and federal rules and regulations applicable to work and project location.
        i. If the work and project location is in the State of Wisconsin, the review fee is $100 for each component, and checks shall be made out to the Wisconsin Department of Commerce.
        ii. If the work and project location is elsewhere, the contractor shall coordinate the fee and check with the local, state, and federal requirements for component submittals of those jurisdictions.
    c. Final component submittals shall include required design criteria and design calculations.
    d. Final component designs and drawings shall be stamped and signed by an engineer legally authorized to practice in the jurisdiction where the project is located.
7. Individual technical specification sections indicate specific requirements for each component. If the following components are included on a project, component submittals shall be done for these items.
    a. Wood Trusses
    b. Precast Concrete Slab and Wall Panels
    c. Pre-Engineered Buildings
    d. Laminated Wood Beams
    e. Steel Joists and Girders
    f. Fire Alarms

D. Additional Submittal Requests
1. The Architect/Engineer may request additional supporting data at any time to help determine compliance of submittals with the Contract Documents.

1.03 QUALITY ASSURANCE

A. Review and Coordination of Submittals
1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted including, but not necessarily limited to:
    a. Determine and verify all interface conditions, catalog numbers, and similar data.
    b. Coordinate with other trades as required.
    c. Clearly indicate all deviations from requirements of the Contract Documents.
2. Verify dimensions and completeness of each submittal. The Architect/Engineer review is limited as defined in the General Conditions of the Contract and does not include dimensions and items not included on the submittals.
3. All corrections to submittals shall be made directly on the submittal literature or drawings (not loose leaf documents) and shall be copied word for word to all copies.
4. Verify that each item and the submittal conforms in all respects with the requirements of the Contract Documents
5. Attach the Contractor's stamp of approval and signature to each submittal to certify that this coordination has been performed. Submittals transmitted to the Architect/Engineer without the Contractor's stamp may be returned without review, and shall be re-submitted when the Contractor's review has been completed and the stamp applied.

1.04 TIMING OF SUBMITTALS

A. General

1. Submittals shall be made far enough in advance of scheduled dates for installation to provide necessary time required for reviews, for securing necessary approvals, for possible revisions and re-submittals, and fo r placing orders and securing delivery.

2. The Contractor shall make the required submittals within the time required to meet the construction schedule or shall present, in writing, valid reasons for any delay.

PART 2 - PRODUCTS

2.01 SUBMITTAL SCHEDULE

A. General

1. Compile a complete and comprehensive schedule of all submittals anticipated to be made during progress of the work. Include a list of each item for which Shop Drawings, Product Data, Samples, Certificates of Compliance, Warranties, or other types of submittals are required. The Contractor shall adhere to the schedule except when specifically otherwise permitted in writing by the Architect/Engineer. The Contractor's failure to submit the fore mentioned schedule will be grounds for withholding certification of payment.

B. Coordination

1. Coordinate the schedule with all necessary subcontractors and materials suppliers to ensure their understanding of the importance of adhering to the approved schedule and their ability to so adhere. Coordinate as required to ensure the grouping of submittals as described below.

2.02 SHOP DRAWINGS

A. Sufficient data in each set of shop drawings shall be included to permit a detailed study of the system submitted.

B. Scale and Measurements: Make all Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work.

C. Maximum sheet size for shop drawings shall be 24"x36".

D. Shop drawings shall be specially drawn for this project, including detailed fabrication and erection drawings, setting drawings, diagrammatic drawings, material schedules, and samples.

E. Shop drawings for all equipment in a given system shall be submitted at one time, with each complete set in a separate brochure.

F. Each sheet of shop drawings shall identify the Project name and location; the Architect/Engineer's name, project number, and contact information including address and telephone number; and the Contractor's name, project number, and contact information including address and telephone number. In addition to the Contractor, the Subcontractor/Fabricator/Manufacturer name, project number, and contact information shall be indicated.

G. All shop drawings shall be numbered in consecutive sequence, and each sheet shall indicate the total number of sheets in the set. Bind each set.

H. Each sheet shall indicate the date issued and any revisions.

I. The shop drawings shall indicate types, shapes and sizes, and finishes of all materials. Where a shop coat of paint/primer is required, its brand name and manufacturer's identification number of type shall be indicated.

2.03 PRODUCT DATA

A. General

1. Submit manufacturer's literature, brochures, technical data, MSDS, etc. to permit a detailed study of the product submitted.

2. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly indicate which portion of the contents is being submitted for

review.

2.04 SAMPLES

A. Samples shall be of the precise article proposed to be furnished.

B. Submit two samples

C. Colors and Patterns: Unless the precise color and pattern is specifically described in the Contract Documents, and whenever a choice of color or pattern is available in a specified product, submit two copies of accurate color and pattern charts to the Architect/Engineer for review and selection.

2.05 CERTIFICATES OF COMPLIANCE

A. Certify that all materials used in the work comply with all specified provisions thereof. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials if, after tests are performed on selected samples, the material is found not to meet specified requirements.

B. Show on each certificate the name and location of the work, name and address of contractor, quantity and date or dates of shipment or delivery to which the certificate applies, and name of the manufacturing or fabricating company. Certification shall be in the form of a letter or company-standard forms containing all required data. Certificates shall be signed by an officer of the manufacturing or fabricating company.

C. In addition to the above information, all laboratory test reports submitted with Certificates of Compliance shall show the date or dates of testing, the specified requirements for which testing was performed, and results of the test or tests.

D. Upon completion of the work, and as a condition of its acceptance, submit to the Architect/Engineer all Certificates of Compliance.

2.06 WARRANTIES

A. All warranties shall be compiled and submitted.

B. Submit three (3) copies.

2.07 OPERATION AND MAINTAINANCE DATA

A. All operational items of equipment require the manufacturer's operation and maintenance data information and parts lists. The information contained therein shall be in agreement with approved shop drawings, wiring diagrams, etc.

B. Five (5) copies, two preliminary and three final, shall be sent to the Architect/Engineer before a "Certificate of Substantial Completion" is issued.

PART 3 - EXECUTION

3.01 IDENTIFICATION OF SUBMITTALS

A. General:

1. Consecutively number all submittals. Accompany each submittal with a Letter of Transmittal containing all pertinent information required for identification and checking of submittals.

2. Include on the Letter of Transmittal the technical specification division number under which the submittal is made.

B. Internal Identification:

1. On at least the first page of each copy of each submittal, and elsewhere as required for positive identification, clearly indicate the submittal number in which the item was included.

C. Re-submittals

1. When material is re-submitted for any reason, transmit under a new Letter of Transmittal and with a new submittal number.

D. Submittal Log:

1. Maintain an accurate submittal log for the duration of the Contract, showing current status of all submittals at all times. Make the submittal log available for the Architect/ Engineer's review upon request.

3.02 COORDINATION OF SUBMITTALS

A. Grouping of Submittals:

1. Unless otherwise specified, make all submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying with the provisions of the Contract Documents and the Contractor shall be strictly liable for all delays so occasioned.

B. Phasing of Submittals:

1. Phasing of Submittals shall not be permitted unless written permission has been given by the Architect/Engineer.
2. Phased submittals when permitted shall follow the sequence below:
   a. First submittal
   b. All subsequent submittals
      i. Newly detailed items shall be easily identified with clouds around the new items(when placed on sheets that were included in the first submittal) or shall be submitted on new drawing sheets.
      ii. New items which are not identified are not reviewed for conformance.
      iii. When changed items are not identified on the submittal, the items are not reviewed for conformance and the Architect/Engineer notations shall not apply to the changes. Refer to the General Conditions of the Contract for changed items other than those requested by the Architect/Engineer.

C. Transmit required submittals to the Architect/Engineer for review. After review, the Architect/Engineer will return the number of submittals required to be returned marked with notations as follows:

1. The notations "Processed", or "Processed with Notations", authorize the Contractor to proceed with the purchase and/or fabrication of the items so noted, subject to the revisions, if any, required by the Architect/Engineer's review comments. Upon receipt, the Contractor shall have sufficient sets of prints made for distribution to appropriate subcontractors, fabricators, manufacturers, and suppliers who require them for coordination of their work.
2. The notation "Re-submit", requires the submittal to be corrected and re-submitted. The Contractor shall not proceed with purchase and/or fabrication of items marked "Re-submit".
3. Corrected and re-submitted items shall not be purchased and/or fabricated until the Architect/Engineer has marked the submittals "Processed", or "Processed with Notations".

D. Revisions after Approval:

1. When a submittal has been reviewed by the Architect/Engineer, re-submittal for substitution of materials or equipment will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary. All decisions by the Owner and Architect are final.

END OF SECTION

SECTION 01 42 00
REFERENCE STANDARDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and type of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
2. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship, which meet or exceed the specifically named code or standard.
3. It is also each Contractor's responsibility, when so required by the Contract Documents or by written request from the Owner, to deliver to the Owner all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested in writing by the Owner, and generally will be required to be copies of a certified report of tests conducted by a testing agency approved for that purpose by the Owner.

B. Related Work Described Elsewhere:

1. Specific naming of codes or standards occurs on the Drawings and in other Sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Familiarity with Pertinent Codes and Standards:

1. In procuring all items used in this Work, it is each Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this work meet or exceed the specified requirements.

B. Rejection of Non-Complying Items:

1. The Owner reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements.
2. The Owner further reserves the right, and without prejudice to other recourse the Owner may take, to accept non-complying items subject to an adjustment in the Contract Amount as approved by the Owner.

C. Applicable standards listed in these Specifications include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:

1. AAMA: American Architectural Manufacturers Association, Schaumburg, IL 60173-4268, (847) 303-5664; www.aamanet.org.
2. AASHTO: American Association of State Highway and Transportation Officials, Washington, DC 20001, (202) 624-5800; www.aashto.org.
3. ACI: American Concrete Institute International, Farmington Hills, MI 48333, (248) 848-3700; www.aci-int.org.
4. ADA(G): Americans with Disabilities Act, and Accessibility Guidelines.
5. AISC: American Institute of Steel Construction, Inc., Chicago, IL 60601-2001, (312) 670-2400; www.aisc.org.
6. ANSI: American National Standards Institute (successor to USASI and ASA0), New York, NY 10036, (212) 642-4900; www.ansi.org.
7. ASTM: American Society for Testing and Materials/ ASTM International, West Conshohocken, PA 19428-2959, (610) 832-9585; www.astm.org.

8. AWS: American Welding Society, Inc., Miami, FL 33126, (305) 443-9353; www.aws.org.
9. AWWA: American Water Works Association, Inc., Denver, CO 80235, (303) 794-7711; www.awwa.org.
10. BOCA: Buildings Officials & Code Administrators International, Inc., (now International Code Council.)
11. CRSI: Concrete Reinforcing Steel Institute, Schaumburg, IL 60173-4758, (847) 517-1200; www.crsi.org.
12. CS: Commercial Standard of National Bureau of Standards, U.S. Department of Commerce, Government Printing Office, Washington, DC 20402.
13. WisDOC: Department of Commerce, 201 W. Washington Ave., Madison, WI 53702, (608) 226-1018.
14. WisDNR: Department of Natural Resources, P.O. Box 7921, Madison, WI 53707-7921, (608) 266-2621.
15. FGMA: Flat Glass Marketing Association, (now Glass Association of North America,) Topeka, KS 66614-5321, (785) 271-0208; www.glasswebsite.com.
16. GA: Gypsum Association, Washington, DC 20002, (202) 289-5440; www.gypsum.org.
17. ICC: International Code Council, Falls Church, VA 22041, (703) 931-4533; www.iccsafe.org.
18. KCMA: Kitchen Cabinet Manufacturers Association, Reston, VA 20191-5435, (703) 264-1690; www.kcma.org.
19. NAAMM: The National Association of Architectural Metal Manufacturers, Chicago, IL 60603, (312) 332-0405; www.naamm.org.
20. NEC: National Electrical Code (see NFPA).
21. NEMA: National Electrical Manufacturers Association, Rosslyn, VA 22209, (703) 841-3200; www.nema.org.
22. NFPA: National Fire Protection Association, Quincy, MA 02169-7471, (617) 770-3000; www.nfpa.org.
23. SDI: Steel Deck Institute, Fox River Grove, IL 60021-0025, (847) 458-4647; www.sdi.org.
24. SJI: Steel Joist Institute, Myrtle Beach, SC 29577-6760, (843) 626-1995; www.steeljoist.org.
25. SSPC: Society for Protective Coatings, Pittsburgh, PA 15222-4656, (412) 281-2331; www.sspc.org..
26. TCA: Tile Council of America, Inc., Anderson, SC 29625, (864) 646-8453; www.tileusa.com.
27. UL: Underwriters Laboratories, Inc., Northbrook, IL 60062-2096, (847) 272-8800; www.ul.com.
28. UBC: Uniform Building Code, International Conference of Building Officials, (now International Code Council).
29. WCSBMPH: Wisconsin Construction Site Best Management Practice Handbook, Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707-7921
30. Federal Specifications and Federal Standards: Specifications Sales (3FRI), Building 197, Washington Navy Yard, General Services Administration, Washington, DC 20407.

END OF SECTION

SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Work under this section includes all labor, materials, equipment, facilities, and services necessary to complete the quality control work as shown on the drawings and herein specified.

B. Related Sections

1. Individual requirements for quality control are defined in other pertinent sections of these Specifications.

C. Payment Procedures

1. Contractor shall provide quality control services specified.
2. Contractor shall provide quality control services required by authorities having jurisdiction whether specified or not.
3. Contractor shall pay for tests and inspections performed by the testing agency unless the Owner has indicated otherwise.
4. Obtain costs for all specified testing and inspections performed by the testing agency and include costs as a line item in Division 01 – Section 00 41 16 Material or Subcontractor Bid Form. Tests and Inspections not specified and estimated costs for re-testing and re-inspection shall not be included in the line item.
5. Testing and inspecting requested by the Contractor and not required by the Contract Documents are the Contractor's responsibility.
6. Contractor shall bear all costs of removal and replacement of material for items that do not remain accessible and exposed for testing and inspections.
7. Contractor shall bear all costs made necessary by non-compliance with the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., including those of repeated procedures and compensation for Design Professional's services and expenses.
8. Even if the Owner pays for original testing and inspections performed by the testing agency, the Contractor shall bear the costs for the following:
    a. Re-testing due to failure of initial test or due to non-compliance with Contract Documents.
    b. Re-inspection of Work due to failure of Work to pass initial inspection or due to non-compliance with Contract Documents.

1.02 DEFINITIONS

A. Quality Assurance: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and to substantiate that proposed construction will comply with requirements.

B. Quality Control: Tests, inspections, procedures, and related activities and actions performed during or after execution of the Work to evaluate that actual products incorporated into the Work and completed construction complies with requirements.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

D. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

E. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the work and for completed Work.

1.03 SYSTEM DESCRIPTION

A. Testing and inspecting services are required to verify compliance with specified requirements and governing rules and regulations, i.e., codes, laws, ordinances, etc. These services do not relieve the Contractor of responsibility for compliance with the Contract Documents.

B. Portions of the Work which do not comply with requirements established by the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., shall be made to comply.

C. Required Testing and Inspections:

1. Individual requirements for testing and inspection are defined in other pertinent sections of these Specifications.
2. Local, state, and federal jurisdiction inspections vary. Confirm the required inspections with the individual authorities.
3. The following testing and inspections shall be performed by a testing agency:
    a. Site excavation inspection, rough grading inspection, and bearing capacity testing: Section 31 00 00 Earthwork.
    b. Soil compaction testing and inspection and pavement base course testing and inspection: Section 31 00 00 Earthwork, 32 11 23 Aggregate Base Course, and Section 32 12 16 Bituminous Concrete Paving.
    c. Concrete reinforcing inspection: Section 03 20 00 Concrete Reinforcement.
    d. Concrete testing: Section 03 30 00 Cast-in-Place Concrete.
    e. Masonry construction testing and inspection: Section 04 21 00 Clay Masonry Units and Section 04 22 00 Concrete Masonry Units.
    f. Structural steel welding, bolts, and stud testing and inspection (except testing to qualify welders): Section 05 12 00.
    g. Metal roof deck inspection: Section 05 31 00.
    h. Underground piping inspection and Water supply testing: Section 33 00 00 Utility Services, Section 33 21 00 Water Supply, Section 33 21 00 Water Supply Wells, and Section 33 36 00 Septic Tank Systems.
    i. Others, if required by the individual sections of these Specifications.
4. Re-testing/Re-inspecting is required for construction that replaced work that failed to comply with the Contract Documents or the provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc.

D. Specified testing and inspecting does not limit the Contractor's other quality assurance and quality control procedures that facilitate compliance with the Contract Documents.

E. Work shall be subject to testing and inspection by the Owner, Design Professional, testing agency, inspectors, and public authorities having jurisdiction.

F. Approval as a result of a testing or inspection shall not be construed to be an approval of a violation of provisions of the Contract Documents, or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc.

G. Testing, inspections, or approvals presuming to give authority to violate or cancel the provisions of the Contract Documents, or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., shall not be valid.

1.04 SUBMITTALS

A. Submittals shall be in accordance with Division 01 – Section 01 33 00 Submittal Procedures.

B. Quality Assurance/Control Submittals

1. Certificate from qualified accreditation authority showing Testing and Inspection Agency's compliance with ASTM Standard E329 for each testing agency used.

C. Schedule of Testing and Inspecting

1. Prepare a Master Schedule of all items to be tested and inspected. By coordination with the construction schedule, establish tentative dates for each such activity.
2. Submit for the Design Professional's review. Make any agreed upon revisions and resubmit.
3. Prepare the schedule including items specified in Division 01 – Section 01 33 00 Submittal Procedures. Also include the following in tabular form:
    a. Specification section number and title
    b. Description of test and/or inspection required
    c. Identification of applicable standard
    d. Identification of test and/or inspection method required
    e. Number of tests and/or inspections required
    f. Time schedule and time span for tests and/or inspections
    g. Entity responsible for performing tests and/or inspections
    h. Requirements for obtaining samples
    i. Unique characteristics/requirements for tests and/or inspections
4. Include in the schedule anticipated tests and/or inspections by manufacturer's representatives and any authorities having jurisdiction.
5. Resubmit schedule when revisions are proposed.

D. Reports

1. Prepare all reports including items specified in Division 01 – Section 01 33 00 Submittal Procedures. Submit certified reports that include the following:
    a. Date of issue.
    b. Project name and location.
    c. Testing and Inspecting Agency contact information including name, project number, address, telephone and facsimile numbers.
    d. Dates and locations of tests and/or inspections.
    e. Names of individuals making tests and/or inspections.
    f. Record of field conditions (temperature & weather) at time of test/inspection.
    g. Product identification and applicable specification section.
    h. Type and description of test/inspection method.
    i. Complete test/inspection data.
    j. Test and inspection results and interpretation of results.
    k. Comments/professional opinions on compliance with the Contract Documents.
    l. Recommendations on re-testing/re-inspection.
    m. Signatures of individuals making tests and/or inspections.
2. Report test results as called for and in the form specified by the test method.

E. Jurisdictional Compliance Paperwork: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Minimum qualification levels are established in individual specification sections in addition to the minimum qualifications specified herein.
2. Testing and Inspecting Agency Qualifications:

a. Testing and Inspecting Agency qualified according to ASTM Standard E329 and with additional qualifications specified in other pertinent individual Specification sections.

b. Testing and Inspecting Agency shall be accredited through an accreditation authority to meet ASTM Standard E329.

   i. Accreditation authority shall be acceptable to the Owner, Design Professional, and authorities having jurisdiction.

   ii. Pre-approved accreditation authorities acceptable to the Design Professional include:

      (a.) American Association for Laboratory Accreditation (A2LA)

      (b.) International Accreditation Service (IAS)

      (c.) National Voluntary Laboratory Accreditation Program (NVLAP)

      (d.) AASHTO Accreditation Program (AAP)

   iii. Pre-approval by the Design Professional does not automatically mean the Testing and Inspecting Agency is acceptable to the Owner or authorities having jurisdiction. The Contractor shall verify acceptability

c. Testing and Inspecting Agency shall be acceptable to the Owner, Design Professional, and authorities having jurisdiction.

   i. Pre-approved Testing and Inspecting Agencies acceptable to the Design Professional include:

      (a.) CGC, Inc.
      2921 Perry Street
      Madison, WI 53713
      Phone: (608) 288-4100
      Fax: (608) 288-7887

      (b.) ECS Illinois, LLC
      1575 Barclay Blvd.
      Buffalo Grove, IL 60089
      Phone: (847) 279-0366
      Fax: (847) 279-0369

      (c.) H. H. Holmes Consulting, Inc.
      2104 N. Sylvania Avenue
      Sturtevant, WI 53177
      Phone: (262) 898-7040
      Fax: (262) 898-7045

      (d.) River Valley Testing Corporation
      715 Post Road, Suite A
      Madison, WI 53713
      Phone: (608) 222-9406
      Fax: (608) 222-9408

      (e.) Soils & Engineering Services, Inc.
      1102 Stewart Street
      Madison, WI 53713-4648
      Phone: (608) 274-7600
      Fax: (608) 274-7511

      (f.) Terracon Consultants, Inc.
      4836 Colt Road
      Rockford, IL 61109

Phone: (815) 873-0990

Fax: (815) 873-0991

ii. Pre-approval by the Design Professional does not automatically mean the Testing and Inspecting Agency is acceptable to the Owner or authorities having jurisdiction. The Contractor shall verify acceptability.

B. Regulatory Requirements

1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.
2. Conform to the applicable requirements and recommendations of the following codes, specifications, and standards except as modified by the Contract Documents and herein:
   a. ASTM Standard E329, 2009, "Standard Specification for Agencies Engaged in Construction Inspection and/or Testing"; ASTM International, West Conshohocken, PA, 2009, DOI: 10.1520/E0329-09, www.astm.org.
3. Where provisions of pertinent regulations, codes, and standards conflict with each other or this specification, the more stringent provisions shall govern. Refer uncertainties and requirements that are different, but apparently equal, to the Design Professional for a decision before proceeding.

PART 2 - PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Minimum levels of source quality control are established in individual specification sections.

PART 3 - EXECUTION

3.01 ADMINISTRATION

A. Testing and Inspecting Schedule

1. Maintain the schedule for testing and inspecting to accurately reflect progress of the Work.
2. Resubmit the testing and inspecting schedule to the Design Professional for review when revisions are proposed. Transmit in adequate time to permit proper rescheduling of activities in connection with inspection and tests.
3. Do not decrease the testing and inspecting activity without written permission from the Design Professional.

B. Test and Inspection Log

1. Prepare a record of tests and inspections that includes the following:
   a. Date test/inspection was conducted.
   b. Description of the Work tested or inspected.
   c. Date test or inspection results were transmitted to the Design Professional.
   d. Name of testing agency or special inspector conducting test or inspection.
   e. Test result – either compliant or noncompliant
   f. Date of re-test/re-inspection.
2. Maintain log at the Project site and provide access to the log for Owner's and Design Professional's reference. Post changes and modifications as they occur.

C. Reports

1. Promptly secure, process, and distribute copies of test and inspection reports and related instructions to ensure necessary retesting, replacement of materials, or both, as required, and with the least possible delay in progress of the Work.
2. Transmit copies of reports created by the testing agency to any public authorities

having jurisdiction when they so direct.

3. Transmit copies of reports created by other entities to any public authorities having jurisdiction when they so direct and to the Design Professional.
4. Promptly secure, process, and distribute copies of certificates of testing, inspection or approval to any public authorities having jurisdiction when they so direct and to the Design Professional.

3.02 PROTECTION AND REPAIR/RESTORATION

A. Protect construction exposed by or for quality control services.

B. Upon completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other specification sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
   2. Comply with Division 01 – Section 01 73 29 Cutting and Patching as applicable.

C. Protection and Repair are the Contractor's responsibility, regardless of whether the Owner directly employs any testing and inspection services.

3.03 FIELD QUALITY CONTROL

A. Coordination
   1. Coordinate sequence of activities to accommodate required quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. Contractor shall cause the Work to remain accessible and exposed for testing and inspection purposes.
   2. Contractor shall make arrangements for all quality control to be completed including the tests and inspections to be performed by testing agencies, inspectors, and public authorities having jurisdiction.
   3. For testing and inspecting specified to be performed by a testing agency, contractor personnel are not allowed to perform these services without direct supervision from testing agency personnel.
   4. Provide preliminary information about materials requiring testing and inspection to the testing agency or other entities requiring it.

B. Notification
   1. Notify appropriate testing agency, inspector, or public authorities having jurisdiction sufficiently in advance of operations that require tests and/or inspections or when the Work is ready for testing and/or inspection. If sufficient notice is not given, reschedule the operations so the appropriate testing and inspections can be completed. Contract time will not be extended to accommodate inadequate notice.
   2. To permit the Design Professional to witness tests and/or inspections when desired, notify the Design Professional not less than 24 hours in advance.

C. Associated Services: Cooperate with testing agency personnel, inspectors, and public authorities having jurisdiction. Provide reasonable auxiliary services as requested along with the following:
   1. Access to and means for testing and inspections of Work and manufacturer's operations promptly upon request.
   2. Incidental labor and facilities needed to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting.
   4. Storage and field curing facilities.
   5. Provide transportation of test materials if necessary.
   6. Security and protection for samples and testing and inspecting equipment at Project

site.

D. Perform indicated testing and inspections at the appropriate time using methods specified and documented in the schedule of testing and inspections. Provide labor to aid in the testing and inspecting services if necessary.

E. Provide testing laboratory facilities required to perform the off-site testing.

F. Report each test and inspection result as indicated.

G. Portions of the Work which do not comply with requirements established by the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., shall be made to comply and such portions shall not be covered or concealed until authorized by testing agency, inspector, and public authorities having jurisdiction.

H. Re-test and re-inspect portions of the Work which did not comply with requirements established by the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc. Report results as indicated.

I. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results as indicated.

3.04 TESTING AGENCY RESPONSIBILITIES AND LIMITATIONS OF AUTHORITY

A. Cooperate with Design Professional and Contractor in performance of duties.

B. Provide qualified personnel to perform required tests and inspections in a reasonable time frame upon notice.

C. Promptly notify Design Professional and Contractor of irregularities, or deficiencies of Work which are observed during performance of services.

D. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

E. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from specified requirements.

F. Submit a certified written report of each test, inspection, and similar quality control service to the Design Professional and Contractor.

G. Testing agency is not authorized to:

1. Release, revoke, alter, or increase any requirements of the Contract Documents.
2. Approve or accept any portion of the Work.
3. Perform any duties of Contractor.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Temporary facilities and controls required for this Work include, but are not necessarily limited to:
   a. Temporary utilities such as water, electricity and heat
   b. Toilets
   c. Field offices and sheds
   d. Temporary signs
   e. Fire protection
   f. Storage of materials
   g. Glass replacement
   h. Cleaning up
   i. Enclosures
2. Related Work Described Elsewhere:
   a. Except that all equipment furnished by Contractors shall comply with all requirements of pertinent safety regulations, the ladders, planks, hoists, and similar items normally furnished by the individual trades in execution of their own portions of the work are not part of this Section.
   b. Permanent installation and hook-up of the various utility lines are described in other pertinent Sections.

1.02 PRODUCT HANDLING

A. Use all means necessary to maintain temporary facilities and controls in proper and safe conditions throughout progress of the Work.

1.03 JOB CONDITIONS

A. Make all required temporary connections to existing utility systems with minimum disruption to services in the existing utility systems. When disruption of the existing service is required, do not proceed without the Architect/Engineer's approval and Owner's consent and, when required, provide alternate temporary service.

PART 2 - PRODUCTS

2.01 UTILITIES

A. General:

1. All temporary facilities shall be subject to the Architect/Engineer's approval.

B. Temporary Lights and Power:

1. The Electrical Trade shall provide temporary service for power and lighting required in construction for all trades until construction has been completed, and approved service connections from the service board. The Electrical Trade shall provide the following facilities:
   a. Approved service connections from the service board. Confirm size of temporary service required and meter and install them accordingly. Provide temporary service from existing electrical service off-site. The new temporary service shall be located overhead on wooden power poles or direct buried into the ground and positioned to avoid conflict with construction equipment and

personnel. Electrical Trade shall provide temporary service connection to a rain-tight service head 16'- 0" above grade.

b. Provide 120 volt lighting and small power tool outlets throughout the Project site.

c. Provide general lighting consisting of 150 watt (minimum) lamps and weatherproof sockets, and provide power outlets consisting of 120 volt pendant type cord connectors, and with ground fault circuit interrupters, for fractional horsepower electrical tools.

d. 120 volt outlets shall be located such that no point in the Project site would make portable cord lengths excessive.

2. Each trade shall provide and maintain their own extension cords.

3. Use of in-place building switches or circuit breakers shall not be permitted. All construction power tools shall be fed from temporary power source with ground fault interrupter protection only.

4. Complete installation shall be in compliance with all applicable codes. The Electrical Contractor shall remove and salvage the temporary service when it is no longer required.

5. Trades requiring temporary three-phase power service shall make arrangements with the Electrical Trade through the General Contractor.

6. The Owner shall pay for all electricity consumed throughout the duration of construction.

C. Temporary Heat and Cold Weather Protection

1. Cold Weather Protection:

a. All heating or covering, or both, required to protect the Project site from damage due to freezing during construction period prior to enclosure of building shall be provided by the General Contractor.

b. Cold weather protection shall be provided by General Contractor.

2. Temporary Heating:

a. When required, until time of substantial completion.

b. In all areas and spaces that are roofed and have all exterior openings suitably enclosed.

3. General Contractor:

a. Provide temporary window and door closures as required and closures for all other temporary openings. Supervise effectiveness of all closures and see that every reasonable precaution is used to prevent escape of heat.

b. Permanent heating system may be used for temporary heating once the permanent heating system, heating controls, concrete installation, concrete curing, concrete saw-cutting, and masonry saw-cutting have been completed.

c. If the permanent system is not operable and the building is enclosed and heating is required, then the General Contractor shall furnish and install a temporary heating system.

d. All portable heating units shall be properly ventilated to prevent combustion gases from remaining in the heated area.

e. The General Contractor shall ascertain if temporary heating equipment will operate on the temporary electrical service available. If service is insufficient to operate equipment, the General Contractor shall make all other arrangements at no additional cost to the Owner.

f. The temporary heating system shall be removed by the General Contractor after the permanent heating system has been installed, is operating, and balanced. Temporary heating equipment shall be relocated by the General Contractor as required during construction to prevent interference with new

construction.

g. Temperatures: Except as otherwise specified, a minimum temperature of 45 degrees F for the building shall be maintained until completion of the Project.

h. Operation: Supervise and be responsible for operation of temporary heating system as required by weather and building conditions through the duration of construction. Be responsible for maintenance of temporary heating systems during period of construction and do any emergency repair work required during temporary operation.

4. The Contractor shall pay for all fuel consumed and temporary heating equipment cost throughout the duration of construction until Substantial Completion at no additional cost to the Owner.

2.02 TOILETS

A. The General Contractor shall provide and maintain temporary sanitary toilets, located where directed, in sufficient number required for the force employed. The toilets shall comply with the requirements of the Wisconsin Department of Commerce, General Orders on Sanitation. Toilets shall be self-contained chemical type.

B. The General Contractor shall maintain the temporary toilets in a sanitary condition at all times and shall supply toilet paper until completion of the Project.

2.03 FIELD OFFICES & SHEDS

A. The General Contractor shall provide and maintain a temporary watertight office where directed for use by the Contractor, Architect, and Owner. The office shall be equipped with a telephone, telephone answering machine, fax machine, plan racks, suitable tables for examination of plans, power, light, heat, and air conditioning.

B. If other offices are provided by other Contractors, they will be located as agreed to by the Contractor, the Architect/Engineer, and Owner.

C. Sheds for storage of materials that may be damaged by weather shall be provided and maintained by each Contractor. Sheds shall have raised wood floors.

D. All temporary facilities including furniture will remain the property of the Contractor and shall be removed from the site after completion of the Work.

2.04 SIGNS

A. No individual advertising signs, plaques or credits, temporary or permanent, will be permitted on the building or premises, except the Contractor's name on his office or material shed.

B. General Contractor shall handle ordering and erection of a Project sign, traffic control signs for the temporary haul road in accordance with local regulations, construction parking signs, and temporary posts for the signs.

C. The General Contractor shall arrange for a suitably constructed Project sign, giving the name of the Project, Owner, Architect/Engineer, General Contractor, Mechanical Contractor, Electrical Contractor, Plumbing Contractor, and Fire Protection Contractor as shown on the Drawings. No other signs will be permitted on the site without written approval of the Architect. The sign shall be installed within two weeks after the Notice to Proceed and shall be maintained in good condition throughout the period of construction at the location shown on the Drawings.

D. Sign contractor shall obtain all necessary county and state sign permits.

2.05 FIRE PROTECTION

A. The General Contractor shall provide and maintain in working order during the entire construction period, a minimum of eight (8) fire extinguishers on each floor level and one (1) in temporary office. Extinguishers shall be of the type and size required by applicable regulatory agency. In addition, any Contractor who maintains an enclosed shed on the site

shall provide and maintain, in an accessible location, one or more similar non-freezing type fire extinguishers in each enclosed shed. The fire extinguishers and cabinets specified under Technical Specification Section 10 44 00 shall not be used for this purpose.

2.06 STORAGE OF MATERIALS

A. The Contractor shall confine equipment, apparatus, storage of materials and operations to limits indicated by directions of the Architect/Engineer and shall not bring material onto the site until they are needed for the progress of the Work.

B. The storage of materials on the site and within the building shall be in strict accordance with the instructions of the Architect/Engineer. Storage of materials within the building shall at no time exceed the design carrying capacity of the structural system.

C. Provide and maintain watertight storage sheds on the premises where directed, for storage of materials that might be damaged by weather. Sheds shall have wood floors raised at least 6" above the ground.

D. All materials affected by moisture shall be stored on platforms and protected from the weather.

E. During the construction of this Project, materials, construction sheds and earth stockpiles shall be located so as not to interfere with the installation of the utilities nor cause damage to existing lines.

F. The Contractor shall allot space to others for storage of their materials and erection of their sheds.

G. Should it be necessary at any time to move material sheds or storage platforms, the Contractor shall move the sheds at the Contractor's expense, when directed by the Owner or Architect/Engineer.

H. The Owner assumes no responsibility for materials stored in building or on the site. The Contractor assumes full responsibility for damage during the storing of materials.

2.07 GLASS REPLACEMENT

A. The Contractor shall assume all costs of replacement of glass broken, cracked, or damaged by him. Glass scratched through improper cleaning shall be considered damaged and shall be replaced by the party that caused the damage.

2.08 CLEANING UP

A. The Contractor shall be financially responsible for clean-up operations. Clean-up must be timely as well as thorough in order to meet safety regulations and permit trades to perform without hindrance from dirt and debris. The Owner will police housekeeping and take appropriate steps to maintain clean, safe working conditions. If the Contractor fails to meet acceptable housekeeping requirements, then the Contractor shall be charged for services arranged for by the Owner.

B. The Contractor shall provide dumpsters throughout the site, schedule periodic removal of all construction waste, and remove all construction waste.

C. "Housekeeping" and clean-up shall be listed on the Schedule of Values and on the Applications and Certificates for Payment as an item of work.

2.09 ENCLOSURES

A. Furnish, install, and maintain for the duration of construction all required tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms, fences and other temporary construction necessary for proper completion of the Work in compliance with all city, safety and other regulations.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section establishes general requirements pertaining to cutting (including excavating), fitting, and patching of the work required to:
   a. Make the several parts fit properly.
   b. Uncover work to provide for installation, inspection, or both, of ill-timed work.
   c. Remove and replace work not conforming to requirements of the Contract Documents.
   d. Remove and replace defective work.

B. Related Work Described Elsewhere:

1. In addition to other requirements specified, upon the Owner's request, uncover work to provide for inspection by the Owner's Representative of covered work, and remove samples of installed materials for testing.
2. Do not cut or alter work performed under separate contract without the Owner's written permission.

1.02 QUALITY ASSURANCE

A. Perform all cutting and patching in strict accordance with pertinent requirements of these Specifications and, in the event no such requirements are determined, in conformance with the Owner's written direction.

1.03 SUBMITTALS

A. Request For The Owner's Consent:

1. Prior to cutting, which affects structural safety or does not affect structural safety, submit written request to the Owner for permission to proceed with cutting.
2. Should conditions of the work, or schedule, indicate a required change of materials or methods for cutting and patching, so notify the Owner and secure his written permission prior to proceeding. Changes in materials and methods will be at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. For replacement of work removed, use materials, which comply with the pertinent Sections of these Specifications.

B. Material used for infill shall match surrounding construction unless noted otherwise.

PART 3 - EXECUTION

3.01 CUTTING & PATCHING

A. During Construction:

1. All openings, chases and lintels in new construction shown on Architectural and Structural Drawings shall be provided by the General Contractor. The mechanical, electrical, fire protection trades, and plumbing trades shall be responsible for providing sleeves, anchors, and inserts for establishing sizes and locations at proper time as to avoid cutting and patching.

B. Work In Place and Existing Construction:

1. For openings, anchors, and inserts required in new construction in place and in existing construction, the following will apply.
    a. Perform cutting and removal by methods, which will prevent damage to other portions of the work and will provide proper surfaces to receive installation of repair and new work. Perform fitting and adjustments of products to provide specified tolerances and finishes.
    b. Unless noted otherwise, the Contractor shall do all cutting required for installation of his work. Patching required because of such cutting shall be performed as follows:
        i. Wherever cutting occurs within unexposed materials, or in materials, which are to remain unfinished when completed, patching shall be performed by Contractor who did cutting.
        ii. Wherever cutting occurs in interior and mortar surfaces scheduled to remain exposed to view, the cutting and patching shall be performed by the Mason through the General Contractor and paid for by Contractor requested cutting. The masonry and mortar shall be cut and patched in toothed pattern matching the material and bond characteristics of the work in place or the existing masonry construction. Cross cutting of masonry units is not permitted.
        iii. Wherever cutting occurs in finished surfaces, patching shall be performed by appropriate Trade Contractor and paid for by Contractor requested cutting. This includes, but is not limited to, painting of plastered and finished surfaces, ceramic tile, and acoustic materials and their supports.

C. Inspection:
    1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, backfilling, and patching.
    2. After uncovering the work, inspect conditions affecting installation of new work.

D. Discrepancies:
    1. If uncovered conditions are not as anticipated, immediately notify the Owner and secure needed directions.
    2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PREPARATION PRIOR TO CUTTING

A. Provide all required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the work.

3.03 PERFORMANCE

A. Perform all required excavating and backfilling as required under pertinent Sections of these Specifications. Perform cutting and removal by methods, which will prevent damage to other portions of the work and will provide proper surfaces to receive installation of repair and new work.

END OF SECTION

SECTION 01 74 00
CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Throughout the construction period, each Contractor shall maintain the Project site in a standard of cleanliness as described in this Section.
2. In addition to standards described in this Section, comply with all requirements for cleaning up as described in various other Sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Inspection:

1. Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards:

1. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

A. Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

PART 3 - EXECUTION

3.01 FINAL CLEANING

A. "Clean," for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled commercial quality building maintenance equipment and materials.

B. Prior to completion of the Work, remove from the Project site all tools, surplus materials, equipment scrap, debris, and waste.

1. Interior:
   a. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
   b. Remove all traces of splashed materials from adjacent surfaces.
   c. Remove paint drippings, spots, stains, and dirt from finished surfaces.
2. Remove all packing materials and dispose of properly.
3. Polished surfaces: To surfaces requiring routine application of buffed polish, apply the polish recommended by manufacturer of the material being polished.

C. Schedule final commercial cleaning as approved by the Architect to enable the Owner to accept a completely clean building and site.

END OF SECTION

SECTION 01 74 19
CONSTRUCITON WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for the following:
   1. Recycling non-hazardous construction waste.
   2. Disposing of non-hazardous construction waste.

B. Related Sections include the following:
   1. Division 01 Section "Multiple Contract Summary" for coordination of responsibilities for waste management.
   2. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.
   3. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

1.03 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.04 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.

1.05 SUBMITTALS

A. Waste Management Plan: Submit 1 electronic copy of plan within 14 days of date established for commencement of the Work. Submit via email to Owner, Architect and LEED Consultant.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit 1 electronic copy of report. Submit via email to Owner, Architect and LEED Consultant. Include the following information:
   1. Material category.
   2. Generation point of waste.

3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Submittals in first four paragraphs below document compliance with requirements for LEED-NC or LEED-CI Credits MR 2. Submittals are not required to be submitted to U.S. Green Building Council (USGBC) as part of LEED certification process but will be needed if Architect or Owner signs letter for LEED credits.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit 1 electronic copy of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work. Submit via email to Owner, Architect and LEED Consultant.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

I. Qualification Data: For Waste Management Coordinator.

J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.06 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council. Waste management coordinator may also serve as LEED coordinator.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.07 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
   1. Total quantity of waste.
   2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
   3. Total cost of disposal (with no waste management).
   4. Revenue from salvaged materials.
   5. Revenue from recycled materials.
   6. Savings in hauling and tipping fees by donating materials.
   7. Savings in hauling and tipping fees that are avoided.
   8. Handling and transportation costs. Include cost of collection containers for each type of waste.
   9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect, Owner, and LEED Consultant. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
   1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.02 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.03 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees at appropriate facility.

1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

a. Comply with requirements in Division 32 Section "Plants." for use of clean ground gypsum board as inorganic soil amendment.

3.04 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 GENERAL

A. Substantial Completion: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, certificate of occupancy from local jurisdiction, and similar documents.
2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities.
3. Prepare and submit Project Record Documents, operation and maintenance manuals, and similar final record information.
4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
5. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
6. Complete startup testing of systems.
7. Submit test/adjust/balance records.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Advise Owner of changeover in heat and other utilities.
10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
11. Complete final cleaning requirements, including touchup painting.
12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Substantial Completion Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request a single re-inspection when the Work identified in the previous inspection as incomplete is completed or corrected.
2. Additional Re-inspections: If additional re-inspections do to incomplete work are necessary, the Architect will be compensated on a time and material basis. The value of the work, performed by the Architect and its staff, shall be deleted from the Contractor's contract in the form of a change order. The Owner will then compensate the Architect directly.
3. Results of completed inspection will form the basis of requirements for Final Completion.

C. Final Completion: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section 01 29 00 "Applications for Payment."

2. Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit three copies of completed Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706, with supporting documents attached thereto including:
    a. Three copies of completed Contractor's Affidavit of Release of Liens, AIA Document G706A.
    b. Three copies of completed Consent of Surety to Final Payment, AIA Document G707, Consent of Surety.
    c. Three copies of completed Consent of Surety to Reduction in or Partial Release of Retainage, AIA Document G707A.
    d. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
    e. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers.
4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
5. Submit pest-control final inspection report and warranty.
6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
7. LEED Requirements:
    a. Refer to Section 01 81 13 "LEED Requirements" for completing final LEED documentation.

D. Final Completion Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
    1. Re-inspection: Request a single re-inspection when the Work identified in the previous inspection as incomplete is completed or corrected.
    2. Additional Re-inspections: If additional re-inspections do to incomplete work are necessary, the Architect will be compensated on a time and material basis. The value of the work, performed by the Architect and its staff, shall be deleted from the Contractor's contract in the form of a change order. The Owner will then compensate the Architect directly.

E. List of Incomplete Items (Punch List): Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
    1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
    2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

F. Project Record Documents: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

G. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

H. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

1. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.

a. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

b. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

I. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

J. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data: Include emergency instructions and procedures, system and equipment descriptions, operating procedures, and sequence of operations.

2. Maintenance Data: Include manufacturer's information, list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds.

3. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

K. Warranties: Submit written warranties to the Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

1. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

2. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

PART 2 - GENERAL

2.01 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

A. Demonstration and Training: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
5. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for system design and operational philosophy, review of documentation, operations, adjustments, troubleshooting, maintenance, and repair.

B. Final Cleaning: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

D. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
2. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
4. Remove construction equipment and surplus material from Project site.
5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains.
6. Remove debris and surface dust from limited access spaces.
7. Sweep concrete floors broom clean in unoccupied spaces.
8. Vacuum carpet and similar soft surfaces; shampoo if visible soil or stains remain.
9. Clean transparent materials, including mirrors and glass. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken transparent materials. Polish mirrors and glass.
10. Remove labels that are not permanent.
11. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored.
    a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    b. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication and foreign substances.
    c. Clean plumbing fixtures to a sanitary condition, free of stains.
    d. Replace disposable air filters and clean permanent air filters.
    e. Clean light fixtures, lamps, globes, and reflectors. Replace burned-out bulbs

and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

12. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
13. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 01 78 13

CONSTRUCTION VERIFICATION ITEMS

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Definitions
- Submittals

PART 2 - PRODUCTS

PART 3 - EXECUTION
- Purpose
- Development Procedure
- Permitted Tracking Systems
- Hardware/Software Requirements
- Completion Procedure
- Verification Procedure
- Sample Tracking Report Formats
- Project Construction Verification Checklists

RELATED WORK

Section 01 91 00 – Commissioning Process
Division 23 – Heating, Ventilating and Air-Conditioning
Division 26 – Electrical

REFERENCE

Applicable provisions of Division 1 govern work under this section.

DEFINITIONS

A/E: Architect / Engineer
Cx: Commissioning
CxP: Commissioning Provider
BMS: Building Management System
TAB: Testing, Adjusting, and Balancing
RFC: Request for Clarification
PC: Personal Computer

SUBMITTALS

A. The following table contains deliverables and/or submittals required under this section, the party(s) responsible for each, the frequency and or timeline these items should be provided, the format and quantity to be provided, and the party(s) to be provided to.

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
Completion of draft checklists	CxP	120 days following contract award	Electronic	Contractor, Owner and A/E
Review comments on checklists provided	Contractor	1 week proceeding receipt of checklists	Electronic	CxP
Final Checklists	CxP	2 weeks proceeding receipt of comments	Paper	Contractor

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
Instructions for completion and utilization of checklists and tracking system	CxP	2 weeks proceeding receipt of checklist comments	Paper (3 copies)	Contractor
Equipment identification tags	CxP	2 weeks proceeding receipt of checklist comments	Laminated Paper (1 copy per unit)	Contractor
Checklist Tracking System	CxP	2 weeks proceeding receipt of checklist comments	Electronic	Contractor
PC and related software defined under the HARDWARE/SOFTWARE REQUIREMENTS for Checklist Tracking System	Contractor	2 weeks proceeding receipt of checklist comments	N/A	N/A
Completion and deficiency reports as defined by CxP	Contractor	Weekly	Electronic	A/E, CxP and Owner
List of deficiencies requiring action	CxP	Weekly, within 3 business days of receipt of deficiency report	Electronic	Contractor
Resolution report for deficiencies	Contractor	Weekly	Electronic	A/E, CxP and Owner
Construction Checklist Completion Summary and Construction Checklist Deficiency Reports	CxP	Monthly	Electronic	Contractor, A/E and Owner
Completed and finalized checklists	Contractor	Substantial completion	Paper	CxP
Checklist verification sampling approach	CxP	1 week prior to commencement of work	Electronic	Contractor
Discrepancy report for periodic checklist verification	CxP	Within 3 business days of checklist verification	Electronic	Contractor
Resolution report for discrepancies	Contractor	Weekly	Electronic	A/E, CxP and Owner
Construction Checklist Verification Completion Summary and Construction Checklist Verification Discrepancy Reports	CxP	Monthly	Electronic	Contractor, A/E and Owner

PART 2 - PRODUCTS

PART 3 - EXECUTION

PURPOSE

The intent of the construction verification checklists is to provide a formalized means to provide individual workers the key criteria for a successful installation and to easily track construction progress.

DEVELOPMENT PROCEDURE

A. Construction verification checklists shall be developed for each section listed under RELATED WORK.
B. CxP shall be responsible to provide Contractor with draft copies of each checklist to be utilized for this project for each equipment/system type within 120 days of contract award. An example showing the rigor and detail that is to be utilized for checklists is provided in Annex A.
C. Checklists shall be provided in the following formats:
    1. EQUIPMENT: Checklists related to a specific piece of equipment or portion of an overall system that is completed in a linear progression similar to the standard installation practices of the equipment.
    2. SYSTEM: Checklists related to the overall distribution system or repetitive equipment found universally throughout a given system (i.e. valves, diffusers, outlets, etc.).
D. Contractor is responsible to review the checklists provided under by CxP and provide any comments or issues related to the specified checklist within 2 weeks proceeding receipt of checklist comments. Failure to provide comments on the checklists shall constitute full acceptance as written.
E. Contractor and A/E are responsible to provide notice to CxP for any project modifications related to the addition or deletion of equipment and/or systems noted under the referenced sections of RELATED WORK.
F. CxP shall incorporate any comments from the Contractor for the final checklists that are not deemed in contradiction to the scope of the project, applicable codes and standards, and the OPR of the project.
G. CxP shall provide contractor with the following items to the Contractor upon incorporation of all applicable comments:
    1. Instructions for completion and utilization of checklists and tracking system.
    2. Checklists for all equipment and systems noted under RELATED WORK in the following format:
        i. SHORT FORM: Paper checklists divided into individual groups as noted within the PROJECT CONSTRUCTION VERIFICATION CHECKLISTS provided under this section. Checklist shall be divided by trade and step of installation with each trade Contractor responsible for the completion of each checklist group. Each group to be provided and tracked as an individual checklist. Checklists to include tracking ID that uniquely identifies the singular piece of equipment or area of the system, and the checklist group the given checklist relates to. Checklist shall include area to mark checklist as complete, as well as an area to note the initials of the individual responsible for completion and the date of completion. Checklists to include space for notation of any deficiencies identified during verification of installation.
    3. Unique identification tags for each piece of equipment related to the systems noted under RELATED WORK. Identifier for tags shall be directly tied to checklists regardless of format utilized.
H. CxP shall provide contractor with the training on the utilization of the checklists and tracking system prior to delivery or commencement of any work related to the checklists.

HARDWARE/SOFTWARE REQUIREMENTS

A. Contractor shall provide a dedicated PC at the site trailer for utilization in the implementation and tracking of construction verification items. This PC shall meet and/or contain the following:
    1. Microsoft Windows XP operating system
    2. Microsoft Office Professional XP
    3. Minimum of 1 GB RAM
    4. Minimum of 60 GB of free hard drive space
    5. LAN or wireless network card interface
B. PC and related software shall be maintained and full access provided to CxP, Owner and Contractors during typical hours of operation on site.

COMPLETION PROCEDURE

A. The following is the permitted method the Contractor is to utilize for completion of all construction verification checklists related to project. Any deviations from this procedure must be authorized by the A/E and CxP.

B. EQUIPMENT CHECKLSITS
   1. The checklists shall be distributed by the Contractor to individuals, sub-contractors, or other trade Contractors at the start of each day for the equipment to be installed or worked on that day.
   2. The checklist shall be completed by the individual completing the work who is responsible for the given delivery or installation step of the equipment.
   3. Checklists shall be completed fully with all information or responses noted in the spaces provided for each item. Any items that cannot be answered due to lack of information with equipment or not being applicable to a given installation shall be noted negatively, with an explanation provided in the deficiency section.
   4. Any negative responses on the checklist shall be explained and documented at the end of the checklist. Explanation shall be detailed to a degree to define the reasoning for non-compliance without further observation.
   5. Once all items on a checklist have been completed, individual shall initial and date checklist in provided space for given group/checklist and mark that group/checklist as complete.
   6. At end of day Contractor to collect all checklists distributed and file any checklists marked as complete for processing.
   7. At end of work week Contractor to record all completed checklists into provided tracking system and distribute pertinent reports to A/E, CxP and Owner as defined by CxP.
   8. Contractor to file all completed and processed checklists separately from in progress checklists and provide to CxP at completion of project.
   9. CxP shall review deficiency reports provided by Contractor within 3 business days of receipt of report and provide a list of deficiencies requiring action by Contractor.
   10. Contractor to record method and date of resolution upon completion of corrective action for deficiency.
   11. Any deficiencies noted for action that are disputed by Contractor and cannot be resolved between the Contractor and the CxP, shall be presented to Owner and A/E for resolution in the form of an RFC.

C. SYSTEM CHECKLISTS
   1. The checklists shall be distributed by the Contractor to individuals, sub-contractors, or other trade Contractors at the start of each work week for the system to be installed or worked on that week.
   2. The checklist shall be completed by the individual completing the work who is responsible for the given installation of the system.
   3. Individual to periodically record the work completed throughout the week for the given system by recording the percentage of completion, the description of work performed, and response to the items identified. Periodicity of this record shall be defined as follows:
      i. For checklists pertaining to areas of systems with an overall installation timeframe <3 weeks, checklist to be completed on a daily basis.
      ii. For checklists pertaining to areas of systems with an overall installation timeframe <8 weeks, but >3 weeks, checklist to be completed twice per week.
      iii. For checklists pertaining to areas of systems with an overall installation timeframe >8 weeks, checklist to be completed on a weekly basis.
   4. Checklists shall be completed fully with all information or responses noted in the spaces provided for each item. Any items that cannot be answered due to lack of information with equipment or not being applicable to a given installation shall be noted negatively, with an explanation provided in the deficiency section.
   5. Any negative responses on the checklist shall be explained and documented at the end of the checklist. Explanation shall be detailed to a degree to define the reasoning for non-compliance without further observation.
   6. Once the percentage of completion for a given system checklists is noted as 100%, individual shall initial and date checklist in provided space for given group/checklist and mark that group/checklist as complete.
   7. At end of work week Contractor to collect all checklists distributed.

8. At end of work week Contractor to record all checklists into provided tracking system and distribute pertinent reports to A/E, CxP and Owner as defined by A/E or CxP and tracking system requirements.
9. Contractor to file all completed and processed checklists separately from in progress checklists and provide to A/E or CxP at completion of project.
10. A/E or CxP shall review deficiency reports provided by Contractor within 3 business days of receipt of report and provide a list of deficiencies requiring action by Contractor.
11. Contractor to record method and date of resolution upon completion of corrective action for deficiency.
12. Any deficiencies noted for action that are disputed by Contractor and cannot be resolved between the Contractor and the CxP, shall be presented to Owner and A/E for resolution in the form of a RFC.

D. The completion of the checklists does not eliminate the Contractor's responsibility for meeting other requirements in the specifications and drawings.

VERIFICATION PROCEDURE

A. Prior to commencement of any work related to the checklists the CxP shall provide the Contractor the sampling percentages to be applied at a minimum for each piece of equipment and system noted under RELATED WORK for verification of the checklists.
B. At the commencement of work related to the checklists the CxP will periodically verify the accuracy, completeness and tracking of the checklists. This verification shall consist of reviewing the as installed conditions of the equipment and/or system versus the statements recorded on the checklists and the progress of the checklists in general.
C. CxP shall record any discrepancies noted between the as installed conditions and/or progress of installation versus the checklists in a formal report to the Contractor within 3 business days of verification.
D. Contractor shall provide CxP method and date of resolution upon completion of corrective action for discrepancy.
E. Any discrepancies noted for action that are disputed by Contractor and cannot be resolved between the Contractor and the CxP, shall be presented to Owner and A/E for resolution in the form of a RFC.
F. If during verification the CxP identifies more than a 10% discrepancy rate for items identified on an individual checklist, or for the overall item count for the checklists for a given equipment or system, the Contractor shall re-validate 100% of the checklists, equipment and/or system.
G. If during verification the CxP identifies more than a 10% discrepancy rate between the current installation completion percentage for a given equipment or system and that reflected in the current checklists, the Contractor will be given a verbal warning regarding this issue and shall be responsible to bring the checklist completion in line with the installation progress by a date defined by the CxP. If this issue is not resolved by the date specified and/or occurs again during the course of the project, the Contractor will be given a written warning regarding this issue and shall be responsible to bring the checklist completion in line with the installation progress by a date defined by the CxP. If this issue is again not resolved by the date specified and/or occurs again during the course of the project, the Contractor will be back charged by the Owner to have the CxP review 100% of all un-completed checklists required to bring the checklist completion in line with the installation progress.

END OF SECTION

ANNEX A – SAMPLE CONSTRUCTION VERIFICATION CHECKLIST

The following checklist is provided as an example only. The content and format does not necessarily reflect the final scope, format or system to be utilized for this project.

Equipment Type:	Modular Boilers
Tag #:	
Location:	
Spec #:	15600
System:	
Checklist Tracking ID:	

Instructions:	
1.	Checklists are organized in groups by installation phase. Each phase is assigned a given responsible contractor which is solely responsible for the construction verification items defined within that group.
2.	Checklists are to be completed in accordance with the stage of delivery, installation or start-up by the individuals responsible for installation.
3.	Circle Yes or No, or provide the requested information for each checklist item.
4	If the information requested for a checklist item is not listed or the item does not apply to the given unit or system, list it as "N/A" and provide the reasoning under the negative responses section.
5.	Explain all discrepancies or negative responses in the negative responses section of the checklist. All discrepancies, negative and "N/A" responses must be defined.
6.	At the completion of each checklist group the party responsible for completion of the checklist group is to mark that group as complete in the provided checkbox, and initial and date in the spaces provided. *Note completion of the checklist group is defined as the complete response to each checklist item within the group including negative responses and the completion of all delivery, installation or start-up tasks related to the equipment for that group.*
7.	Provide checklist to lead contractor at completion of each work day.

Group/Item	Group/Task Description	Submitted	Delivered
A	MODEL VERIFICATION		
1	Manufacturer		
2	Model		
3	Serial Number		
4	Total Input / Output Capacity (MBH)	/	/
5	Gas inlet pressure (psi)		
6	Burner motor HP		
7	Voltage / Phase / Frequency (V / - / Hz)	/ /	/ /
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____

Group/Item	Group/Task Description	Response	
B	PHYSICAL CHECKS		
1	Unit is free from physical damage.	YES	NO
2	The water and gas openings are sealed with plastic plugs.	YES	NO
3	All components present.	YES	NO
4	Installation and startup manual provided.	YES	NO
5	Unit tags affixed.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
C	INSTALLATION		
1	Unit located indoors and protected from freezing temperatures.	YES	NO
2	Unit not located near an air-moving device.	YES	NO
3	Proper clearances from combustible surfaces maintained per manufacturer's instructions and applicable codes.	YES	NO
4	Installation area free of corrosive elements and flammable materials.	YES	NO
5	Unit is set on concrete housekeeping pad and is level.	YES	NO
6	Unit secured as required by manufacturer and specifications.	YES	NO
7	Equipment location coordinated with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances.	YES	NO
8	Adequate clearance around unit for service.	YES	NO
9	All components accessible for maintenance.	YES	NO
10	Unit labeled and is easy to see.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
D	VENTILATION AND COMBUSTION AIR SUPPLY		
1	Fresh air not taken from areas that contain negative pressure producing devices.	YES	NO

Group/Item	Group/Task Description	Response	
2	Fresh air supply free of corrosive elements and flammable vapors.	YES	NO
3	Fresh air openings located correctly with consideration given to the blocking effect of louvers and grilles.	YES	NO
4	Overall ductwork length and restrictions comply with manufacturer requirements.	YES	NO
5	Ductwork is the same cross-sectional area as openings.	YES	NO
6	All ductwork is properly sealed and sloped per manufacturer specifications.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
E	VENT PIPE SYSTEM		
1	Draft hood for atmospheric burners properly installed.	YES	NO
2	Vent connectors securely fastened with screws and supported properly to maintain 6-inch clearance.	YES	NO
3	Vent connector made of approved material and sloped correctly.	YES	NO
4	Vent pipe system in accordance with "National Fuel Gas Code", NFPA 54, ANSI Z223.1-Latest Edition or prevailing provisions of local codes.	YES	NO
5	Overall ductwork length and restrictions comply with manufacturer requirements.	YES	NO
6	Flue baffle engaged in slots provided in the flue tube.	YES	NO
7	Flue way, draft hood or vent pipe system not obstructed in any way.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
F	WATER PIPING		
1	All piping components have been installed (in the correct order) as required by contract document or manufacturer.	YES	NO
2	Piping arranged for ease of unit removal.	YES	NO
3	Piping supported as required by specifications.	YES	NO
4	Piping is clean.	YES	NO
5	Unit connected to water supply, return, and drain piping using unions or flanges and isolation valves.	YES	NO
6	Dielectric fittings installed to isolate dis-similar pipe materials.	YES	NO
7	Piping and valves properly checked and free of leaks.	YES	NO
8	Thermometers and pressure gauges supplied on supply and return lines.	YES	NO
9	Balancing valve supplied for each boiler branch (multiple boiler arrangements ONLY).	YES	NO
10	Piping insulation is complete and installed as per specifications.	YES	NO
11	All valves and test ports are easily accessible.	YES	NO
12	Valve tags attached.	YES	NO
13	Pressure and temperature relief valve(s) for correct pressure and temperature installed.	YES	NO
14	Pressure and temperature relief valve(s) piped with sufficient pipe diameter to drain designed for boiling water.	YES	NO
15	Drain valve provided.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
G	STEAM PIPING (IF APPLICABLE)		
1	All piping components have been installed (in the correct order) as required by contract document or manufacturer.	YES	NO
2	Strainer and isolation valve installed.	YES	NO
3	Proper condensate trap installed.	YES	NO

Group/Item	Group/Task Description	Response	
4	Pressure relief valve installed prior to heat exchanger for steam supply pressures above maximum recommended pressure ratings for unit.	YES	NO
5	Safety and pressure relief devices installed in manner to minimize personnel and property damage.	YES	NO
6	Piping pitched for proper condensate flow.	YES	NO
7	Piping arranged for ease of unit removal.	YES	NO
8	Piping supported as required by specifications.	YES	NO
9	Piping is clean.	YES	NO
10	Piping and valves properly checked and free of leaks.	YES	NO
11	Pressure gauges supplied on supply lines.	YES	NO
12	Piping insulation is complete and installed as per specifications.	YES	NO
13	All valves and test ports are easily accessible.	YES	NO
14	Valve tags attached.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
H	GAS PIPING		
1	Gas supply is the same type as listed on the unit data plate.	YES	NO
2	Pressure reducing valves provide correct pressure to unit.	YES	NO
3	Gas cock / valve and union provided on gas supply.	YES	NO
4	Drip / dirt leg and cap provided on gas supply.	YES	NO
5	Pressure relief valves are piped to outdoors.	YES	NO
6	Piping and valves properly checked and free of leaks.	YES	NO
7	Proper gas train provided (FM/IRI arrangements).	YES	NO
8	Gas utility company inspected installation (if required).	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
I	ELECTRICAL		
1	Local disconnect installed in accessible and visible location.	YES	NO
2	All electrical connections are tight.	YES	NO
3	All electrical components are grounded.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
J	CONTROLS INSTALLATION		
1	Control panel accessible and labeled properly.	YES	NO
2	Remote start and stop wiring installed and communication verified.	YES	NO
3	Remote status wiring installed and communication verified.	YES	NO
4	Remote alarm wiring installed and communication verified.	YES	NO
5	Hot water temperature reset signal verified and programmed.	YES	NO
6	Actuators installed and calibration verified.	YES	NO
7	Low water cutoff switch installed and operational.	YES	NO
8	High temperature limit sensor installed and programmed per contract documents.	YES	NO
9	High pressure limit sensor installed and programmed per contract documents (steam boilers ONLY).	YES	NO
10	Hot water supply and return temperature sensors installed and communication verified.	YES	NO
11	Steam supply pressure sensor installed and communication verified (steam boilers ONLY).	YES	NO
12	Circulation pump wired and operational (if applicable).	YES	NO
13	Test ports installed near all control sensors.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
K	MECHANICAL STARTUP		
1	System flushed, filled, and air purged.	YES	NO
2	Burner adjusted to proper settings and CO_2, CO, and combustion efficiencies are acceptable.	YES	NO

Group/Item	Group/Task Description	Response	
3	System starts and runs without any unusual noise or vibration.	YES	NO
4	Pressure and temperature relief valve(s) set to proper pressure and temperature and manually checked for functionality.	YES	NO
5	Manufacturer's startup checklist completed and attached.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
L	CONTROLS STARTUP		
1	Low water cut off sequence verified and acceptable.	YES	NO
2	High temperature limit sequence verified and acceptable.	YES	NO
3	High pressure limit sequence verified and acceptable (steam boilers ONLY).	YES	NO
4	Flame safety sequences verified and acceptable.	YES	NO
5	Heating sequence verified and acceptable.	YES	NO
6	Temperature reset schedule verified and acceptable.	YES	NO
7	Lead/lag sequence verified and acceptable.	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____
M	TAB		
1	Minimum flow conditions for boiler verified and acceptable (primary pumping systems ONLY).	YES	NO
❑ CHECKLIST GROUP COMPLETE	INITIALS: _____	DATE:	_____

A. Negative Responses

Group/ Item	Date Found	Found By	Reason for Negative Response	Resolved	Date Resolved	Resolution
				YES / NO		
				YES / NO		
				YES / NO		
				YES / NO		
				YES / NO		

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. To aid in the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated in the Work, furnish and deliver the data described in this Section and in pertinent other Sections of these Specifications.

B. Related Work Described Elsewhere:

1. Make all submittals in strict accordance with the provisions of Section 01 33 00 and the Special Conditions of the Contract.
2. Required contents of submittals may also be amplified in other pertinent Sections.

1.02 QUALITY ASSURANCE

A. In preparation of data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the degree needed for communicating the essential data.

1.03 SUBMITTALS

A. Preliminary:

1. Submit two copies of a preliminary draft of the proposed manual or manuals to the Architect/Engineer for review and comments. Architect will submit one manual to the Owner for its review.

B. Final:

1. Unless otherwise directed in other pertinent Sections, or in writing by the Architect/Engineer, submit three copies of the final manual to the Architect/Engineer prior to indoctrination of operation and maintenance personnel.

PART 2 - PRODUCTS

2.01 INSTRUCTION MANUALS

A. General:

1. Where instructions are required to be submitted under other Sections of these Specifications, prepare in accordance with the following:

B. Format:

1. Size: 8-1/2" x 11".
2. Paper: White bond, at least 20 lb. weight.
3. Text: Neatly typewritten.
4. Drawings: 11" in height preferable; bind in with text; foldout acceptable; larger drawings acceptable, but fold to fit within the manual and provide a drawing pocket inside rear cover or bind in with text.
5. Flysheets:
   a. Separate each portion of the manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.
6. Binding:
   a. Use heavy-duty plastic or cardboard covers with binding mechanism concealed inside the manual; 3-ring binders will be acceptable; all binding shall be subject

to the Architect's approval.

7. Measurements:
   a. Show the U.S. measurements plus the SI equivalents.

C. Covers:
1. Provide front and back covers for each manual, using durable material approved by the Architect/Engineer and clearly identified on or through the front cover with at least the following information:
   a. PROJECT NAME
   b. PROJECT OWNER
   c. LOCATION
      i. (general subject of this manual)
      ii. (space for approval signature of the Architect/Engineer and approval date)

D. Contents: Include at least the following:
1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the manual of all emergency data regarding the installation.
   a. Complete instructions regarding operation and maintenance of all equipment involved, including lubrication, disassembly, and reassembly.
   b. Complete nomenclature of all parts of all equipment.
   c. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other pertinent data regarding procurement procedure.
   d. Electrostatic copy of all guarantees and warranties issued.
   e. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturer's data with which this installation is not concerned.
   f. Such other data as required in other pertinent Sections of these Specifications.

PART 3 - EXECUTION

3.01 INSTRUCTION MANUALS

A. Preliminary:
1. Prepare a preliminary draft of each proposed manual. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering. Secure the Architect/Engineer's approval prior to proceeding with final.

B. Final:
1. Complete the manuals in strict accordance with the approved preliminary drafts and the Architect/Engineer's review comments.

C. Revisions:
1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of manuals with the Architect/Engineer. If the Contractor is required by the Architect to revise previously approved manuals, compensation will be made as provided under "Changes to the Contract" in the General Conditions.

END OF SECTION

SECTION 01 78 36
WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section 01 33 00 "Submittal Procedures" specifies procedures for submitting warranties.
2. Divisions 2 through 48 Sections for specific requirements for warranties on products and installations specified to be warranted.
3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturers' disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturers' disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

D. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own Contract.

1.03 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.04 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.

D. Owner's 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, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.05 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

C. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.

D. Form of Submittal: At Final Completion compile 3 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.

E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS

2.01 Not Used

PART 3 - EXECUTION

3.01 LIST OF WARRANTIES

A. Schedule: Provide warranties on products and installations as specified in the following Sections:

1. Section 06 60 00 – Solid Polymer Fabrications
2. Section 07 41 50 – Metal Wall Panels
3. Section 08 11 00 – Steel Doors and Frames
4. Section 08 11 16 – Aluminum Doors, Frames, & Windows
5. Section 08 14 00 – Wood Doors
6. Section 10 22 26 – Operable Partitions
7. Section 21 00 00 – Fire Protection
8. Section 22 10 00 - Plumbing
9. Section 23 00 00 - Heating, Ventilating and Air Conditioning
10. Section 23 09 00 - Controls & Instrumentation
11. Section 26 24 16 - Panelboards
12. Section 26 20 00 - Distribution Panelboard
13. Section 26 50 00 - Lighting
14. Section 26 09 00 - Lighting Control Equipment

END OF SECTION

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Throughout progress of the work, each Contractor shall maintain an accurate record of all changes in the Contract Documents, as described in Article 3.01 below.
2. Upon completion of the work of this contract, transfer the recorded changes to a set of Record Documents, as described in Article 3.02 below.

B. Related Work Described Elsewhere:

1. Section 01 33 00: Submittal Procedures

1.02 QUALITY ASSURANCE

A. General:

1. The Contractor shall delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved in advance by the Architect/Engineer.

B. Accuracy of Records:

1. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other documents where such entry is required to properly show the change. Accuracy of records shall be such that future searches for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.

C. Timing of Entries:

1. Make all entries within 24 hours after receipt of information.

1.03 SUBMITTALS

A. Final Submittal:

1. Prior to submitting Request for Final Payment, submit the final Record Documents to the Architect/Engineer and secure his approval.

1.04 PRODUCT HANDLING

A. Use all means necessary to maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the work and transfer of the recorded data to the final Record Documents. In the event of loss of recorded data, use all means necessary to secure the data to the Architect/Engineer's approval; such means shall include, if necessary in the opinion of the Architect/Engineer, removal and replacement of concealing materials and, in such case, all replacements shall be to the standard originally specified in the Contract Documents.

PART 2 - PRODUCTS

2.01 RECORD DOCUMENTS

A. Job Set:

1. Promptly following Award of Contract, secure from the Architect/ Engineer at no charge to the Contractor, one complete set of all documents comprising the Contract.

B. Final Record Documents:

1. At a time near the completion of the work, secure from the Architect/Engineer at no

charge to the Contractor, one complete set of all Drawings and Specifications included in the Contract.

PART 3 - EXECUTION

3.01 MAINTENANCE OF JOB SET

A. Identification:

1. Immediately upon receipt of the job set described in Paragraph 2.01 above, identify each of the Documents with the title "Record Documents - Job Set".

B. Preservation:

1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Architect/Engineer.
   a. Do not use the job set for any purpose except entry of new data and for review by the Architect/Engineer, until start or transfer of data to final Record Documents.
   b. Maintain the job set at the site of Work as that site is designated by the Architect/Engineer.

C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by note and by graphic line, as required. Date all entries. Call attention to the entry by a "cloud" around the area or areas affected. In the event of overlapping changes, different colors may be used for each of the changes.

D. Making Entries on Other Documents:

1. Where changes are caused by directives issued by the Architect/Engineer, clearly indicate the change by note in ink, colored pencil, or rubber stamp.
2. Where changes are caused by Contractor - originated proposal approved by the Architect/Engineer, including inadvertent errors by the Contractor which have been accepted by the Architect/Engineer, clearly indicate the change by note in erasable colored pencil.
3. Make entries in the pertinent Documents as approved by the Architect/Engineer.

E. Conversion of Schematic Layouts:

1. In most cases on the Drawings, arrangement of conduits and circuits, piping, ducts, and other similar items, is shown schematically and is not intended to portray precise physical layout. Final physical arrangement is as deter-mined by the Contractor, subject to the Architect/Engineer's approval. However, design of future modifications of the facility may require accurate information as to the final physical arrangement of items which are shown only schematically on the Drawings.
2. Show on the job-set of Record Drawings, by dimension accurate to within 1", the center line of each run of items such as are described in Paragraph 3.01.E.1. above. Clearly identify the item by an accurate note such as "cast iron drain", "galv. water", etc. Show by symbol or note the vertical location of the item ("under slab", "in ceiling plenum", "exposed", etc.). Make all identification sufficiently descriptive that it may be related reliably to the Specifications.
3. The Architect/Engineer may waive the requirements for conversion of schematic data where, in the Architect/Engineer's judgment, such conversion serves no beneficial purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Architect/Engineer.
4. Timing of Entries: Be alert to changes in the work from how it is shown in the Contract Documents. Promptly, and in no case later than 24 hours after the change

has occurred and been made known to the Contractor, make the entry or entries required.

5. Accuracy of Entries: Use all means necessary, including the proper tools for measurement, to determine actual locations of the installed items.

3.02 FINAL RECORD DOCUMENTS

A. General:

1. The purpose of the final Record Documents is to provide factual information regarding all aspects of the work, both concealed and visible, to enable future modification of design to proceed with lengthy and expensive site measurement, investigations, and examination.

B. Approval of Recorded Data Prior to Transfer:

1. Following receipt of the documents described in Paragraph 2.01-B above, and prior to start of transfer of recorded data thereto; secure a review by the Architect of all recorded data. Make all required revisions.

C. Transfer of Data to Drawings:

1. Carefully transfer all change data shown on the job-set of Record Drawings to the corresponding sepia, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items described in Paragraph 3.01-E above. Call attention to each entry by drawing a "cloud" around the area or areas affected. Make all change entries on the Drawings neatly, consistently, and in ink or crisp black pencil.

D. Transfer of Data to Other Documents:

1. If the Documents other than Drawings have been kept clean successfully during progress of the Work, and if entries have been sufficiently orderly thereon to the approval of the Architect/Engineer, the job-set of those Documents (other than Drawings) will be accepted by the Architect/Engineer as final Record Documents for those Documents. If any such Document is not so approved by the Architect/Engineer, secure a new copy of that Document from the Architect/Engineer at the Architect/Engineer's usual charge for reproduction; carefully transfer the change data to the new copy and to the approval of the Architect/ Engineer.

E. Review and Approval:

1. Submit the completed total set of Record Documents to the Architect as described in Paragraph 1.03 above. Participate in review meeting or meetings as required by the Architect/Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect/ Engineer. Architect will deliver a copy of the Contractor's final Record Documents to the 46453.

3.03 CHANGES SUBSEQUENT TO ACCEPTANCE

A. The Contractor shall have no responsibility for recording changes in the Work subsequent to acceptance of the Work by the Owner, except for changes resulting from replacements, repairs, and alterations made by Contractor as part of his guarantee.

END OF SECTION

SECTION 01 79 00

TRAINING AND DEMONSTRATION

PART 1 – GENERAL
- Related Work
- Reference
- Definitions
- Submittals

PART 2 - PRODUCTS

PART 3 - EXECUTION
- Training Objectives
- Submittal
- Training Session Format

RELATED WORK

Section 01 91 00 – Commissioning Process
Division 23 – Heating, Ventilating and Air-Conditioning
Division 26 – Electrical

REFERENCE

Applicable provisions of Division 1 govern work under this section.

DEFINITIONS

A/E: Architect / Engineer

SUBMITTALS

A. The following table contains deliverables and/or submittals required under this section, the party(s) responsible for each, the frequency and or timeline these items should be provided, the format and quantity to be provided, and the party(s) to be provided to.

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
Draft training program	Contractor	120 days prior to substantial completion	Electronic	A/E and Owner
A/E draft training program review comments/approval	A/E	Within 10 business days of receipt of program	Paper (as specified under GENERAL CONDITIONS)	Contractor
Training materials	Contractor	60 days prior to scheduled training	Electronic	A/E and Owner
A/E training materials review comments/approval	A/E	Within 10 business days of receipt of program	Paper (as specified under GENERAL CONDITIONS)	Contractor
Training session notifications	Contractor	2 days prior to scheduled session	Electronic	Owner
Completed training sessions record	Contractor	Within 2 business days of sessions	Paper (1 copy)	A/E
A/E training session review comments/approval	A/E	Within 10 business days of session	Paper (as specified under GENERAL CONDITIONS)	Contractor

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
Training session videos	Contractor	Within 30 days of completion of training	Electronic	A/E and Owner

PART 2 – PRODUCTS

PART 3 – EXECUTION

A. TRAINING OB JECTIVES

1. The training objectives defined below clearly define the objectives/topics to be covered for training and demonstration of the owner for this project. These objectives state by system the minimum training to be provided to the Owner's personnel for each system in this facility. The Contractor is responsible for providing a comprehensive and cohesive training program covering each objective as it relates to their area of responsibility (i.e. division or section) under the terms of this Contract. This shall include coordination, scheduling and assurance of completion.

Equipment/System	Objectives/Topics	Applicable Sections	Party(s) Responsible
Fire Alarm	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 26 Contractor
	3. Facility walkthrough identifying location of all devices and panels		
	4. System operation and programming including demonstration of weekly and monthly testing procedures		
	5. System maintenance requirements per NFPA and local jurisdiction		
	6. Demonstration of fire alarm activates and integrations and alarms in conjunction with door closures, system shut down, etc.		
	7. Testing and inspection requirements and reporting for local jurisdiction		
	8. Identification of outstanding punchlist items		
Fire Protection	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 23 & 26 Contractors
	3. Review of valve chart		
	4. Facility walkthrough identifying location of all devices, valves, test ports, etc.		
	5. System operation and programming including demonstration of weekly and monthly testing procedures		
	6. System maintenance requirements per NFPA and local jurisdiction		
	7. Demonstration of fire alarm integrations and alarms		
	8. Testing and inspection requirements and reporting for local jurisdiction		
	9. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	10. Identification of outstanding punchlist items		
Domestic Water	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 23

Equipment/System	Objectives/Topics	Applicable Sections	Party(s) Responsible
	3. Review of valve chart		& 26 Contractors
	4. Facility walkthrough identifying location of all devices, valves, test ports, etc.		
	5. Operation, maintenance and troubleshooting of all pumps		
	6. Demonstration of control and alarming systems		
	7. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	8. Identification of outstanding punchlist items		
Domestic Hot Water	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 23 & 26 Contractors
	3. Review of valve chart		
	4. Facility walkthrough identifying location of all devices, valves, test ports, etc.		
	5. Operation, maintenance and troubleshooting of all pumps		
	6. Operation, maintenance and troubleshooting of all temperature control, mixing valves, and water heaters		
	7. Demonstration of control and alarming systems		
	8. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	9. Demonstration of operation and control of loop temperatures		
	10. Identification of outstanding punchlist items		
Sanitary Waste	1. System design concept and capabilities		A/E
	2. Review of red lines and riser diagrams		Division 23 & 26 Contractors
	3. Review of valve chart		
	4. Facility walkthrough identifying location of all devices, valves, test ports, etc.		
	5. Operation, maintenance and troubleshooting of all pumps and ejectors		
	6. Demonstration of controls and alarms for status and overflow		
	7. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	8. Identification of outstanding punchlist items		
Storm Drainage	1. System design concept and capabilities		A/E
	2. Review of red lines and riser diagrams		Division 23 Contractors
	3. Review of valve chart		
	4. Facility walkthrough identifying location of all devices, valves, cleanouts, etc.		

Equipment/System	Objectives/Topics	Applicable Sections	Party(s) Responsible
	5. Identification of waste outfalls and demonstrate access to and how to rod system		
	6. Demonstration of access to and how to rod system		
	7. Identification of outstanding punchlist items		
Heat Pump Loop	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 23 & 26 Contractors
	3. Review of valve chart		
	4. Facility walkthrough identifying location of all devices, valves, test ports, etc.		
	5. Review of coil operation sequences		
	6. Operation, maintenance and troubleshooting of all pumps		
	7. Demonstration of all alarms, safeties and control sequences		
	8. Review of water treatment chemicals, testing procedures and troubleshooting		
	9. Operations, maintenance, troubleshooting and calibration procedures for each meter and sensor type		
	10. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	11. Review of maintenance contract, including logging, daily inspections and other items required of to assure appropriate operation between maintenance visits		
	12. Identification of outstanding punchlist items		
Supply Air	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 23 & 26 Contractors
	3. Facility walkthrough identifying location of all devices, dampers, test ports, etc.		
	4. Review of AHU operation sequences		
	5. Operation, maintenance and troubleshooting of all fans and coils		
	6. Demonstration of all alarms, safeties and control sequences		
	7. Review of filter removal and replacement		
	8. Review of greasing and lubrication procedures for all applicable devices and parts		
	9. Operations, maintenance, troubleshooting and calibration procedures for each sensor type		
	10. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	11. Identification of outstanding punchlist items		
Exhaust Air	1. System design concept and capabilities		A/E

Equipment/System	Objectives/Topics	Applicable Sections	Party(s) Responsible
	2. Review of red lines		Division 23 & 26 Contractors
	3. Facility walkthrough identifying location of all devices, dampers, test ports, etc.		
	4. Review of HRU operation sequences		
	5. Operation, maintenance and troubleshooting of all fans and coils		
	6. Demonstration of all alarms, safeties and control sequences		
	7. Review of filter removal and replacement, including special precautions for hazardous or contaminated filters		
	8. Review of greasing and lubrication procedures for all applicable devices and parts		
	9. Identify safety requirements and procedures for prevention of inhaling containments during fan maintenance		
	10. Operations, maintenance, troubleshooting and calibration procedures for each sensor type		
	11. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	12. Identification of outstanding punchlist items		
Packaged and Terminal AC Units	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 23 & 26 Contractors
	3. Facility walkthrough identifying location of all devices, valves, test ports, etc.		
	4. Review of AHU and FCU operation sequences		
	5. Operation, maintenance and troubleshooting of all fans, coils, and FCU		
	6. Demonstration of all alarms, safeties and control sequences		
	7. Review of filter removal and replacement, including		
	8. Review of greasing and lubrication procedures for all applicable devices and parts		
	9. Operations, maintenance, troubleshooting and calibration procedures for each sensor type		
	10. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	11. Identification of outstanding punchlist items		
Building Management System	1. Review of as-built documents, programming and graphics		Division 23 Contractor
	2. Demonstration of the operation of all systems, features and sequences		

Equipment/System	Objectives/Topics	Applicable Sections	Party(s) Responsible
	3. Manufacturer's shop maintenance training session for general BMS controls systems		
	4. Manufacturer's shop maintenance training session for laboratory temperature and airflow controls systems		
	5. Operations, maintenance, troubleshooting and calibration procedures for each sensor type		
	6. Identification of outstanding punchlist items		
Operable Partitions	1. Manufacturer's operation instruction for operators		Division 10 Contractor
	2. Manufacturer's maintenance and troubleshooting instruction		
Overhead Doors	1. Manufacturer's operation instruction for operators		Division 8 Contractor
	2. Manufacturer's maintenance and troubleshooting instruction		
Electrical Power	1. System design concept and capabilities		A/E
	2. Review of red lines and panel schedules		Division 26 Contractor
	3. Facility walkthrough of main distribution room, floor distribution panels, mechanical rooms, etc.		
	4. Operation, maintenance and troubleshooting of all transformers, switchboards, motor control centers, TVSS and panels		
	5. Demonstration of all alarms, safeties and control sequences		
	6. Operations, maintenance, troubleshooting and calibration procedures for each sensor type		
	7. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	8. Identification of outstanding punchlist items		
Interior Lighting and Controls	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 26 Contractor
	3. Facility walkthrough identifying location of all fixtures, panels, etc.		
	4. Operation, maintenance, programming and troubleshooting of all contactors, lighting panels, etc.		
	5. Demonstration of the operation of all systems, features and sequences		
	6. Walk through of building to identify each fixture type and demonstrate bulb and ballast replacement for each type		
	7. Review locations, types, and maintenance/programming instruction for occupancy sensors		

Equipment/System	Objectives/Topics	Applicable Sections	Party(s) Responsible
	8. Operations, maintenance, troubleshooting and calibration procedures for each sensor type		
	9. Identification of outstanding punchlist items		
Variable Frequency Drives	1. Manufacturer's training program as described in the manufacturer's training guide for the as-built condition of each unit, including operation theory, operations, maintenance and troubleshooting		Division 23 & 26 Contractors
	2. Review of set-up and programming for each drive		
	3. Operations, maintenance, troubleshooting and calibration procedures for each drive		
	4. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	5. Identification of outstanding punchlist items		
Emergency Power	1. System design concept and capabilities, including connected loads and transfer sequence		A/E
	2. Review of electrical and fuel system red lines and panel schedules		Division 26 Contractor
	3. Facility walkthrough of main distribution room, floor distribution panels, mechanical rooms, etc.		
	4. Operation, maintenance and troubleshooting of all generators, transfer switches, switchboards, motor control centers and panels		
	5. Demonstration of all alarms, safeties and sequences of operation		
	6. Operations, maintenance, troubleshooting and calibration procedures for each sensor type		
	7. Annual maintenance requirements for major equipment (as performed by attendees and witnessed/directed by instructor)		
	8. Identification of outstanding punchlist items		
Security	1. System design concept and capabilities		A/E
	2. Review of red lines		Division 26 Contractors
	3. Facility walkthrough identifying location of all devices, panels, etc.		
	4. Operation, maintenance, programming and troubleshooting of all devices.		
	5. Demonstration of the operation of all systems, features and sequences		
	6. Review programming instructions for creating, editing and deleting authorized persons		

Equipment/System	Objectives/Topics	Applicable Sections	Party(s) Responsible
	7. Identification of outstanding punchlist items		
User Orientation	1. Facility walkthrough defining typical lab modules and operational capabilities and procedures of space and equipment contained within each module		A/E and Owner
	2. Emergency operation and shut down procedures for laboratory spaces		Owner
Facility OPR & BOD	1. Review of facility OPR and BOD prior to controls commissioning and start-up		A/E, Owner, CxP

B. SUBMITTAL

1. Contractor shall be responsible to submit a formal training program to be utilized for each respective system under their responsibility 120 days prior to substantial completion to A/E and Owner. It is Contractor's responsibility to work with Owner, A/E and other contractors to develop a cohesive training session schedule that complies with Owner's personnel availability, scheduling requirements of A/E and other contractor's sessions, and completion of all training sessions prior to substantial completion. Training program shall include at a minimum the following:
   i. Session title
   ii. Proposed date of session
   iii. Intended audience
   iv. List of systems and equipment to be reviewed
   v. Training objectives and topics by system and equipment
   vi. Listed durations for each objective and topic
   vii. Instructor, including name and affiliation, for each objective and topic
   viii. Instructor qualifications for each instructor listed. Contractor is responsible to ensure each instructor has an intimate knowledge of the system or equipment and the installation for this project. Owner shall have the right of refusal to reject any proposed instructor that is not deemed qualified for provision of training.
   ix. Total duration of session
2. Within 10 business days of receipt of training program A/E shall provide Contractor with formal response and action for draft training program.
3. 60 days prior to initial scheduled training session Contractor shall submit training materials to be utilized for all sessions under there responsibility to A/E and Owner. These materials shall include at a minimum the following:
   i. Detailed agenda
   ii. Contractor contact sheet, including address, phone number, fax number and e-mail.
   iii. O&M data applicable to session
   iv. Copy of as-builts
   v. Additional materials to be utilized including copies of any materials and/or videotapes to be utilized during the session
4. Within 10 business days of receipt of training program A/E shall provide Contractor with formal response and action for draft training program.
5. 2 days prior to scheduled training session Contractor shall notify Owner of confirmation for training session.
6. Training records must be submitted to A/E within 2 business days of completion of training session.
7. Within 10 business days of training session A/E shall provide Contractor with formal response and action for session. Any sessions deemed as unacceptable or rejected shall be re-done and taped at the convenience of the Owner.
8. Training videos shall be supplied to Owner and A/E within 30 days of completion of training.

C. TRAINING SESSION FORMAT

1. All training sessions shall follow the approved agenda and shall be provided in the following format:
   i. Classroom session

ii. Site walk-through
iii. Field demonstration of operation
iv. Contractor directed and reviewed annual maintenance of equipment or system, provided by Owner personnel

2. Day of training session Contractor shall ensure listed instructors for session are on site and at training location 15 minutes prior to scheduled start of session.
3. Day of training session Contractor shall distribute and collect a formal training record to attendees and instructors for completion and signature.
4. All training sessions shall be videotaped with reasonable video/audio quality by the Contractor for future reference and training. Final training videos shall be labeled and provided in DVD format and shall be professionally edited and programmed for ease of use.

END OF SECTION

SECTION 01 81 13
LEED REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on LEED 2009 For New Construction and Major Renovations.

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

B. Related Sections:

1. Divisions 01 through 33 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.03 CONTRACTOR RESPONSIBILITY

A. The contractor shall be responsible for all submittals and LEED Online forms for the following construction-related Prerequisites and Credits that this project needs to obtain:

1. Sustainable Sites
   a. Prerequisite 1: Construction Pollution Prevention Plan
2. Energy and Atmosphere
   a. Prerequisite 1: Fundamental Commissioning of Building Energy Systems
3. Materials and Resources
   a. Credit 2: Construction Waste Management – 75%
   b. Credit 4: Recycled Content – 20%
   c. Credit 5: Regional Materials – 20%
   d. Credit 7: Certified Wood
4. Indoor Environmental Quality
   a. Credit 3.1: Construction Indoor Air Quality Management Plan – During Construction
   b. Credit 3.2: Construction Indoor Air Quality Management Plan – Before Occupancy
   c. Credit 4.1: Low-Emitting Materials – Adhesives and Sealants
   d. Credit 4.2: Low-Emitting Materials – Paints and Coatings
   e. Credit 4.3: Low-Emitting Materials – Flooring Systems
   f. Credit 4.4: Low-Emitting Materials – Composite Wood and Agrifiber Products
   g. Innovation and Design: Contractor shall set a goal to get at least one exemplary performance credit from the Materials and Resources credits.
5. Contractor shall be responsible for coordinating with Design Professional on "design" credits that work towards LEED certification.

1.04 REFERENCES

A. Conform to the applicable requirements of the LEED 2009 for New Construction and Major Renovations.

1.05 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. LEED: Leadership in Energy & Environmental Design.

C. Rapidly Renewable Materials: Materials made from plants that are typically harvested within a 10-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

D. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

E. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from Project site. Manufacturing refers to the final assembly of components into the building product that is installed at Project site.

F. Regionally Extracted and Manufactured Materials: Regionally manufactured materials made from raw materials that are extracted, harvested, or recovered within a radius of 500 miles from Project site.

G. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

H. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).

1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.06 SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. Project Materials Cost Data: Provide statement indicating total cost for building materials used for Project, excluding mechanical, electrical, and plumbing components, and specialty items such as elevators and equipment.

D. LEED Action Plans: Provide preliminary submittals within 14 days of date established for commencement of the Work indicating how the following requirements will be met:

1. Prerequisite SS P1: Construction Activity Pollution Prevention. Contractor shall adhere to Erosion and Sediment Control Plans, and provide a schedule of documentation for LEED certification with utilizing either date-stamped photography or periodic inspections and documentation throughout construction process. Contractor shall be responsible for completing this form in LEED Online.
2. Credit MR 2: Waste management plan complying with Division 01 Section "Construction Waste Management and Disposal."
3. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
4. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
5. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
6. Credit IEQ 3.1: Construction indoor-air-quality management plan.

E. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Prerequisite SS P1: Contractor shall adhere to Erosion and Sediment Control Plans, and provide a schedule of documentation for LEED certification with utilizing either date-stamped photography or periodic inspections and documentation throughout construction process.
2. Credit MR 2: Waste reduction progress reports complying with Division 01 Section "Construction Waste Management and Disposal."
3. Credit MR 4: Recycled content.
4. Credit MR 5: Regional materials.
5. Credit MR 6: Rapidly renewable materials.
6. Credit MR 7: Certified wood products.

F. LEED Documentation Submittals:

1. Prerequisite SS P1: Construction Activity Pollution Prevention. Contractor shall adhere to Erosion and Sediment Control Plans, and provide a schedule of documentation for LEED certification with utilizing either date-stamped photography or periodic inspections and documentation throughout construction process. Contractor shall be responsible for completing this form in LEED Online.
2. Credit MR 2: Comply with Division 01 Section "Construction Waste Management and Disposal."
3. Credit MR 4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
4. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
    a. Include statement indicating distance from manufacturer to Project for each regionally manufactured material.
5. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
6. Credit IEQ 3.1:
    a. Construction indoor-air-quality management plan during construction.

b. Product data for temporary filtration media.

c. Product data for filtration media used during occupancy.

d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

7. Credit EQ 3.2:

a. Construction indoor-air-quality management plan before occupancy.

b. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

c. Product data for filtration media used during flush-out and during occupancy.

d. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

8. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).

9. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating chemical composition and VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).

10. Credit IEQ 4.3: Carpet Systems.

11. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.07 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

B. Regulatory Requirements

1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.

2. Conform to LEED 2009 for New Construction and Major Renovations Rating System and Reference Manual and applicable Addenda.

PART 2 - PRODUCTS

2.01 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 20 percent of cost of materials used for Project.

1. Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.

2. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.

3. Do not include mechanical and electrical components in the calculation.

2.02 REGIONAL MATERIALS

A. Credit MR 5: Provide 20 percent of building materials (by cost) that are regional materials.

2.03 CERTIFIED WOOD

A. Credit MR 7: Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
   a. Rough carpentry.
   b. Miscellaneous carpentry.
   c. Heavy timber construction.
   d. Wood decking.
   e. Metal-plate-connected wood trusses.
   f. Structural glued-laminated timber.
   g. Finish carpentry.
   h. Architectural woodwork.
   i. Wood paneling.
   j. Wood veneer wall covering.
   k. Wood flooring.
   l. Wood lockers.
   m. Wood cabinets.
   n. Furniture.
2. Wood-based materials include only permanently installed materials in the project. Wood purchased for temporary use on the project (e.g. formwork, bracing, scaffolding, sidewalk protection, and guard rails) may be included in the calculation at the project team's discretion. If any such materials are included, all msuch materials must be included in the calculations.

2.04 LOW-EMITTING MATERIALS

A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Categories below are taken from LEED rating systems and the standards referenced by them; if clarification is required, see those documents or the reference guides.
2. Wood Glues: 30 g/L.
3. Metal to Metal Adhesives: 30 g/L.
4. Adhesives for Porous Materials (Except Wood): 50 g/L.
5. Subfloor Adhesives: 50 g/L.
6. Plastic Foam Adhesives: 50 g/L.
7. Carpet Adhesives: 50 g/L.
8. Carpet Pad Adhesives: 50 g/L.
9. VCT and Asphalt Tile Adhesives: 50 g/L.
10. Cove Base Adhesives: 50 g/L.
11. Gypsum Board and Panel Adhesives: 50 g/L.
12. Rubber Floor Adhesives: 60 g/L.
13. Ceramic Tile Adhesives: 65 g/L.
14. Multipurpose Construction Adhesives: 70 g/L.
15. Fiberglass Adhesives: 80 g/L.

16. Contact Adhesive: 80 g/L.
17. Structural Glazing Adhesives: 100 g/L.
18. Wood Flooring Adhesive: 100 g/L.
19. Structural Wood Member Adhesive: 140 g/L.
20. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet Applied Rubber Lining Adhesive: 850 g/L.
28. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
30. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
31. Architectural Sealants: 250 g/L.
32. Nonmembrane Roof Sealants: 300 g/L.
33. Single-Ply Roof Membrane Sealants: 450 g/L.
34. Other Sealants: 420 g/L.
35. Sealant Primers for Nonporous Substrates: 250 g/L.
36. Sealant Primers for Porous Substrates: 775 g/L.
37. Other Sealant Primers: 750 g/L.

B. Credit EQ 4.2: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
1. Categories below are taken from LEED rating systems and the standards referenced by them; if clarification is required, see those documents or the reference guides.
2. First nine subparagraphs below apply to LEED-NC.
3. Flat Paints, Coatings, and Primers: VOC not more than 50 g/L.
4. Nonflat Paints, Coatings, and Primers: VOC not more than 150 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
6. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
7. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
8. Floor Coatings: VOC not more than 100 g/L.
9. Shellacs, Clear: VOC not more than 730 g/L.
10. Shellacs, Pigmented: VOC not more than 550 g/L.
11. Stains: VOC not more than 250 g/L.
12. Remaining 15 subparagraphs apply to LEED-CI.
13. Flat Interior Topcoat Paints: VOC not more than 50 g/L.
14. Nonflat Interior Topcoat Paints: VOC not more than 150 g/L.
15. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
16. Clear Wood Finishes, Varnishes and Sanding Sealers: VOC not more than 350 g/L.

17. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
18. Floor Coatings: VOC not more than 100 g/L.
19. Shellacs, Clear: VOC not more than 730 g/L.
20. Shellacs, Pigmented: VOC not more than 550 g/L.
21. Stains: VOC not more than 250 g/L.
22. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
23. Before retaining first three subparagraphs below, verify that they are acceptable for LEED-CI.
24. Dry-Fog Coatings: VOC not more than 400 g/L.
25. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
26. Pretreatment Wash Primers: VOC not more than 420 g/L.
27. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
28. 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.

C. Credit EQ 4.4: Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.
    1. Composite wood and agrifiber products used on the interior of the building (i.e. inside the weatherproofing system) must contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies must not contain added urea-formaldehyde resins.
    2. Composite wood and agrifiber products are defined as:

a. Particleboard
b. Medium density fiberboard (MDF)
c. Plywood
d. Wheatboard
e. Strawboard
f. Panel Substrates
g. Door Cores

PART 3 - EXECUTION

3.01 LEED ONLINE

A. Contractor shall be responsible for completing all of the construction credits and prerequisites in LEED Online and assuring compliance with each credit.
   1. Contractor shall coordinate with Design Professional on obtaining access to LEED Online for Project.

3.02 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2: Comply with Division 01 Section "Construction Waste Management and Disposal."

3.03 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
   1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 01 Section "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
   2. Replace all air filters immediately prior to occupancy.
   3. Air-Quality Testing:
      a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "LEED-NC: Reference Guide."
      b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
         i. Note that it may be necessary to comply with requirements in Credits IEQ 4.1, 4.2, 4.3, and 4.4 to comply with the limits specified in first five subparagraphs below.
         ii. Formaldehyde: 50 ppb.
         iii. Particulates (PM10): 50 micrograms/cu. m.
         iv. Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
         v. 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
         vi. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
      c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non complying building areas, take samples from same locations as in the first test.
      d. Air-sample testing shall be conducted as follows:
         i. All measurements shall be conducted prior to occupancy but during

normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.

ii. Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.

iii. Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.

iv. Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION

SECTION 01 86 00

FUNCTIONAL PERFORMANCE TESTING

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Definitions
- Submittals
- Test Methods

PART 2 - PRODUCTS

PART 3 - EXECUTION
- Purpose
- Development Procedure
- Pre-Implementation Procedure
- Implementation Procedure
- Seasonal Testing Procedure
- Non-Conformance and Approval of Tests
- Project Functional Performance Tests

PART 1 - GENERAL

1.01 RELATED WORK

A. Section 01 91 00 – Commissioning Process

B. Division 23 – Heating, Ventilating and Air-Conditioning

C. Division 26 – Electrical

1.02 REFERENCE

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

B. DEFINITIONS

1. A/E: Architect / Engineer
2. Cx: Commissioning
3. CxP: Commissioning Provider
4. O&M: Operations and Maintenance
5. P/T: Pressure / Temperature
6. BMS: Building Management System
7. TAB: Testing, Adjusting, and Balancing
8. OPR: Owner's Project Requirements
9. FPT: Functional Performance Tests
10. RFI: Request for Information
11. CO: Change Order

1.03 SUBMITTALS

A. Contractor to supply formal review and comment to CxP on procedures supplied by CxP for application to project, adherence to warranty requirements and general safety.

B. CxP shall provide contractor with list of criteria required for contractor readiness notification. Whereas contractor readiness notification is deemed as the formal notification by Contractor for initiation of functional testing. These criteria shall be provided for each commissioned system to be tested and shall consist of the following items at a minimum:

1. Completed copies of all construction verification checklists for equipment and systems pertaining to commissioned system.

2. Written and approved notification of the resolution of all deficiencies, discrepancies and issues noted for equipment and systems pertaining to commissioned system.
3. Completed and approved copies of all start-up, testing and balancing reports specified for equipment and systems pertaining to commissioned system.

C. Contractor to supply construction schedule providing a minimum of 28 days prior to substantial completion for the functional and seasonal testing of all commissioned systems. Schedule is to comply with general scheduling requirements specified under 01 91 00 and shall provide sufficient time prior to specified testing period to meet contractor readiness notification requirements.

D. Prior to commencement of testing period Contractor to provide CxP with a proposed plan to implement the tests specified by CxP for approval. Plan to include the following on an hour/day schedule.
1. Personnel to be in attendance
2. Tools to be provided
3. Duration provided for each test
4. Arrangement of tests to maximize personnel utilization and minimize down time required for test preparation.

E. Fourteen (14) days prior to commencement of testing period Contractor to provide A/E, Owner and CxP with a copy of the contractor readiness notification for each commissioned system.

F. Seven (7) days prior to commencement of testing period Contractor to provide CxP with conformation that FPT testing period and schedule are finalized and approved.

G. The following table contains deliverables and/or submittals required under this section, the party(s) responsible for each, the frequency and or timeline these items should be provided, the format and quantity to be provided, and the party(s) to be provided to.

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
Draft FPT procedures	CxP	120 days following contract award	Electronic	Contractor, Owner and A/E
Review comments on draft FPT procedures	Contractor	1 week proceeding receipt of checklists	Paper (2 copies)	A/E and CxP
Final FPT procedures	CxP	2 weeks proceeding receipt of comments	Electronic	Contractor
Contractor readiness criteria	CxP	120 days following contract award	Electronic	Contractor
Construction schedule with FPT provisions	Contractor	1 week prior to commencement of work	Electronic	A/E, Owner and CxP
FPT plan	Contractor	4 weeks prior to commencement of testing	Electronic	A/E, Owner and CxP
Contractor readiness notification	Contractor	14 days prior to commencement of testing	Paper (3 copies)	A/E, Owner and CxP

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
FPT readiness conformation	Contractor	7 days prior to commencement of testing	Electronic	CxP
Preliminary FPT report and list of deficiencies requiring action	CxP	Within 5 business days of completion of testing	Electronic	Contractor
Resolution report for FPT deficiencies	Contractor	Within 10 business days of receipt of report	Electronic	A/E, Owner and CxP
FPT re-test plan (if applicable)	Contractor	14 days prior to commencement of testing	Electronic	A/E, Owner and CxP
Final FPT report	CxP	Within 5 business days of completion of testing	Electronic	Contractor and Owner
Seasonal testing plan	CxP	Within 5 business days of completion of substantial completion	Electronic	Contractor and Owner
Seasonal testing readiness conformation	Contractor	7 days prior to commencement of testing	Electronic	CxP
Preliminary seasonal testing report and list of deficiencies requiring action	CxP	Within 5 business days of completion of testing	Electronic	Contractor
Resolution report for seasonal test deficiencies	Contractor	Within 5 business days of receipt of report	Electronic	A/E, Owner and CxP
Final seasonal testing report	CxP	Within 5 business days of receipt of resolution report	Electronic	Contractor and Owner

1.04 TEST METHODS

A. FPT is achieved in accordance with the procedures outlined by the CxP with the example provided under Annex A. For the purpose of clarity CxP may require Contractor to employ one of the following methods below:

1. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
2. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting shall be allowed, but shall be used with caution and avoided when possible.
3. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten

values.

4. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable.
5. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses.

B. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy as defined by CxP. Provided a minimum sampling rate of 20% of the similar units is provided and that units with significant application differences and significant sequence of operation differences are not included in the overall sample.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PURPOSE

A. The intent of the functional performance tests is to provide a formalized means to verify the completion and functional preparedness of the commissioned systems for operation and occupancy.

3.02 DEVELOPMENT PROCEDURE

A. FPT shall be developed for each section listed under RELATED WORK.

B. CxP shall be responsible to provide Contractor with draft copies of each FPT to be utilized for this project for each commissioned system within 120 days of contract award. An example showing the rigor and detail that is to be utilized for FPT procedures is provided in Annex A.

C. Contractor is responsible to review the FPT provided under by CxP and provide any comments or issues related to the specified FPT within two weeks of receipt of procedures. Failure to provide comments on the FPT shall constitute full acceptance as written and obligation of Contractor to full warrant the application, safety and warranty terms of the equipment and system under the conditions presented by the tests specified.

D. Contractor and A/E are responsible to provide notice to CxP for any project modifications related to the addition or deletion of equipment and/or systems noted under the referenced sections of RELATED WORK.

E. CxP shall incorporate any comments from the Contractor that are not deemed in contradiction to the scope of the project, applicable codes and standards, and the OPR of the project.

3.03 PRE-IMPLEMENTATION PROCEDURE

A. The following is the permitted method the Contractor is to utilize prior to implementation of all FPT related to project. Any deviations from this procedure must be authorized by the A/E and CxP.

1. Contractor supplies CxP with FPT plan four (4) weeks prior to scheduled testing period.
2. CxP reviews FPT plan and provide comments to Contractor.
3. Contractor provides contractor readiness notification for commissioned systems within fourteen (14) days prior to scheduled testing period.
4. CxP with confirmation of FPT readiness seven (7) days prior to testing period

commencement.

3.04 IMPLEMENTATION PROCEDURE

A. CxP is NOT responsible for the operation of equipment/systems and/or conducting the testing on the equipment/systems. CxP is only responsible for witnessing, reporting and approving the tests conducted by the Contractor. Contractor is fully responsible for operation of equipment/systems and conducting the testing on the equipment/system specified under the FPT procedures to the satisfaction of CxP.

B. The following is the permitted method the Contractor is to utilize for implementation of all FPT related to project. Any deviations from this procedure must be authorized by the A/E and CxP prior to testing.

1. On day of scheduled test Contractor shall have personnel and tools present to accomplish test. If required personnel and/or tools are not present Contractor shall be responsible for re-testing in accordance with the requirements specified under RE-TESTING PROCEDURE.
2. Contractor shall ensure BMS and/or data logging equipment is set-up for trending specified for each test prior to initiation of test.
3. Contractor shall implement testing according to approved FPT plan unless directed by CxP.
4. If minor issues are identified during the test CxP and Contractor shall review issue and formulate resolution to continue test. Contractor shall repair or remedy issues identified and test shall be continued once completed. CxP shall clearly identify the issue and method of resolution in the FPT report.
5. If major issues are identified during the test Contractor shall terminate test immediately and work with A/E and CxP to determine the method of resolution. CxP shall clearly identify the issue in the FPT report. Upon resolution of these issues Contractor shall supply CxP with report detailing method of resolution and proposed schedule for re-testing according to the requirements specified under RE-TESTING PROCEDURE.
6. If at any point, frequent failures are occurring and testing is requiring excessive troubleshooting, CxP may stop the testing and require the responsible Contractor to perform and document a checkout of the remaining units and systems, prior to continuing with functional testing. Failures of this nature shall constitute a re-test and handled in accordance with the guidelines specified for re-testing under this section.

C. CxP is solely responsible for defining what constitutes a minor or major issue during a test. Minor issues are defined as issues related to deficiencies in the installation of equipment or system that can be resolved without interpretation by the A/E and/or not requiring significant time for resolution that would cause delay to the completion of the test. Major issues are defined as issues related to deficiencies in the installation of equipment or system that cannot be resolved without interpretation by the A/E and/or requiring significant time for resolution that would cause significant delay to the completion of the test.

D. At the completion and approval of all tests CxP shall provide A/E, Owner and Contractor with final copy of FPT report.

E. The completion of the FPT does not eliminate the Contractor's responsibility for meeting other testing requirements in the specifications and drawings.

3.05 SEASONAL TESTING PROCEDURE

A. Portions of or tests in whole are required to be run under near peak load conditions. For these instances the Contractor will be required to attend and implement seasonal tests under the direction of CxP.

B. Within five (5) business days from substantial completion Contractor and CxP shall develop and agree upon a seasonal testing plan, which shall have the same format and detail required for the FPT plan defined in this section.

C. Contractor to provide CxP with confirmation of seasonal testing readiness seven (7) days prior to testing period commencement.

D. Contractor and CxP shall follow identical procedure defined for FPT under this section for all seasonal tests, including methods for issue resolution and re-testing.

E. At the completion and approval of all tests CxP shall provide A/E, Owner and Contractor with final copy of seasonal test report.

F. The completion of the seasonal tests does not eliminate the Contractor's responsibility for meeting other testing requirements in the specifications and drawings.

3.06 NON-CONFORMANCE AND APPROVAL OF TESTING

A. Non-Conformance

1. CxP is solely responsible to record the results of the functional and seasonal testing on the forms developed and approved. All issues or non-conformance issues shall be noted and reported in these forms.
2. Corrections of minor issues identified may be made during the tests at the discretion of CxP. In such cases the issue and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, CxP will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues.
4. If there is a dispute about an issue, regarding whether it is an issue or who is responsible:
   a. The issue shall be documented on the test form with the Contractor's response and a copy given to the A/E, Owner and Contractor assumed to be responsible.
   b. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
   c. CxP documents the resolution process.
   d. Once the interpretation and resolution have been decided, the appropriate party corrects the issues, issues the statement of correction and provides it to CxP.
   e. CxP and Contractor re-test the test at issue until satisfactory performance is achieved in accordance with re-testing guidelines provided under this section.

B. Failure Due to Manufacturer Defect

1. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the A/E or Owner. In such case, the Contractor shall provide the Owner with the following:
   a. Within one week of notification from the A/E, Owner and CxP, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the A/E within two weeks of the original notice.
   b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
   c. A/E, Owner and CxP will determine whether a replacement of all identical units or a repair is acceptable.
   d. Two examples of the proposed solution will be installed by the Contractor and

the A/E, Owner and CxP will be allowed to test the installations for up to one week, upon which the A/E and Owner will decide whether to accept the solution. Cost of this re-testing for A/E, Owner and CxP shall fall under the guidelines for re-testing presented in this section.

e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

C. Approval.

1. CxP shall have the sole responsibility of determining the satisfactory completion and approval of any and all functional and seasonal tests. CxP shall provide A/E, Contractor and Owner with formal approval of each functional and seasonal test as part of the final FPT report.

3.07 RE-TESTING PROCEDURE

A. CxP is responsible for attendance at one attempt per test, where an attempt is defined as the participation and attendance at a test at the time approved under the FPT readiness conformation.

B. Any requirement for a re-test for a given test shall constitute the back charge to the responsible Contractor by the Owner for the attendance of CxP. CxP shall be solely responsible for determining the responsible party, and a re-test shall be defined in this context as any time where a test defined under this section for the project cannot be fully executed due to any of the following conditions:

1. Date and time of test changed without a minimum of seven (7) days notice to CxP.
2. Improper or insufficient personnel and/or tools on site at time of test.
3. Deficiencies or discrepancies present at time of test that have been previously noted by CxP and remain unresolved.
4. Any issues that require a re-test or stoppage of tests in progress.
5. Failure of test for reason under responsibility of Contractor and/or Contractor responsible for sub or feed system (i.e. controls, electrical, etc.).
6. Failure due to manufacturer defect.

C. The cost for Contractor to re-test a functional or seasonal test, if Contractor is deemed responsible by CxP, shall be theirs. If Contractor is not responsible, any cost recovery for re-testing costs shall be negotiated by Contractor with responsible party.

D. If for any reason the issue requiring a re-test is deemed by CxP to be out of the control and/or responsibility of the Contractor the cost of the re-test shall be assigned to the party responsible. At a minimum under this definition the following conditions of these terms shall be as follows:

1. Any design issues deemed by Owner shall have costs assigned to A/E.
2. Acts of nature, disaster or terrorism shall have no additional costs assigned or approved. Contractor and CxP shall provide a single re-test at no cost.

E. Any required re-testing by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

3.08 PROJECT FUNCTIONAL PERFORMANCE TEST PROCEDURES

A. Refer to Annex A following this section for copies of the FPT to be utilized for this project.

ANNEX A –SAMPLE FUNCTIONAL PERFORMANCE TEST PROCEDURE

The following FPT is provided as an example only. The content and format does not necessarily reflect the final scope, format or systems to be utilized for this project.

PART 4 - Boiler Functional Performance Test

Date: _____ Start Time: _____ End Time _____

Estimated Duration: _____
Cx Provider(s): _____
_____
_____

Applicable Equipment: _____

Objectives
This test is performed to investigate the ability of the boiler to provide heating water or steam for the facility.

Instrumentation

Instrument	Accuracy	Measurement
N/A	N/A	N/A

Stated Sequence
TBD

Procedure

1. Hot Water Temperature Reset
    a. Verify boilers are in occupied mode. If not override system into occupied mode.
    b. Record outside air temperature and hot water supply temperature.
    c. Override outside air temperature to be 10° above current outside air temperature.
    d. Verify hot water temperature decreases with override proportionally.
    e. Override outside air temperature to be 10° below current outside air temperature.
    f. Verify hot water temperature increases with override proportionally.
    g. Return outside air temperature to normal operation.
2. Staging Up
    a. Override hot water temperature set point to be 15° above current reading.
    b. Verify lead boiler circulation pump energizes and lead boiler fires at low fire.
    c. Record the hot water supply and return temperatures, as well as the time lead boiler started.
    d. Lower the delay time between all stages to a maximum of 3 minutes.
    e. Verify lead boiler modulates to high fire after three minutes at low fire setting.
    f. Record the hot water supply and return temperatures.
    g. Verify lag boiler circulation pump energizes and lag boiler fires at low fire after lead boiler has been under operation at high fire for 3 minutes.
    h. Record the hot water supply and return temperatures.
    i. Verify lag boiler modulates to high fire after three minutes at low fire setting.
    j. Record the hot water supply and return temperatures.
    k. Repeat steps g to j for each additional lag boiler present.
    l. Verify lead and lag boilers continue to operate until hot water temperature set point is achieved and record time.
3. Staging Down

a. With all boilers firing, lower hot water temperature set point to be 15° below current reading.
b. Record the hot water supply and return temperatures, as well as the time test started.
c. Verify lag boiler(s) modulates to low fire after 3 minutes at new setpoint.
d. Record the hot water supply and return temperatures.
e. Verify lag boiler(s) shuts down after operation at low fire for 3 minutes.
f. Verify lag boiler(s) circulation pump de-energizes thirty seconds after lag boiler(s) has shut down.
g. Record the hot water supply and return temperatures.
h. Verify lead boiler modulates to low fire after 3 minutes has passed since last lag boiler(s) shut down.
i. Record the hot water supply and return temperatures.
j. Verify lead boiler shuts down after operation at low fire for 3 minutes.
k. Verify lead boiler circulation pump de-energizes thirty seconds after lead boiler has shut down.
l. Record time of lead boiler shut down.
m. Return system and settings to normal mode and original set points.

4. Minimum Boiler Flow (primary pumping systems ONLY)
   a. Override hot water temperature set point to be 5° above current reading.
   b. Verify one boiler pump energizes and boiler fires at low fire.
   c. Override all control valves to close in hot water system. For 3-way valves ensure valves are set to bypass coil.
   d. Verify boiler has minimum flow per manufacturer requirements.
   e. Override all 3-way valves to coil.
   f. Verify boiler has minimum flow per manufacturer requirements.
   g. Override all control valves to close in hot water system. For 3-way valves ensure valves are set to bypass coil.
   h. Shut down ON boiler via local disconnect.
   i. Verify lag boiler pump energizes and lag boiler fires at low fire.
   j. Verify boiler has minimum flow per manufacturer requirements.
   k. Override all 3-way valves to coil.
   l. Verify boiler has minimum flow per manufacturer requirements.
   m. Override all control valves to close in hot water system. For 3-way valves ensure valves are set to bypass coil.
   n. Shut down ON boiler via local disconnect.
   o. Repeat steps ix through xiv for each lag boiler.
   p. Return system to normal operation and conditions.
5. Unoccupied Mode
   a. Change the current time to be in unoccupied mode.
   b. Verify all connected loads to hot water system are also in unoccupied mode and not operational.
   c. Override boilers and pump to normal.
   d. Verify boilers and pumps do not come ON.
   e. Manually start one load served by the hot water system.
   f. Verify boilers and pumps are energized.
   g. Manually shut down the energized air handling unit from step e.
   h. Verify boilers and pumps shut down in accordance with proper cool down and minimum run times for boilers.
   i. Return system to and equipment to normal operations and occupied mode.
6. Alarms and Safeties
   a. With lead boiler ON in occupied mode (adjust hot water temperature set point if necessary), manually shut OFF boiler via disconnect.
   b. Verify lag boiler energizes and alarm is generated at local control panel and/or BAS head end.
   c. Repeat steps a and b for each lag boiler.
   d. Return all boilers to normal operating conditions.
   e. With lead boiler ON in occupied mode (adjust hot water temperature set point if necessary), shut down circulation pump for boiler via disconnect.

f. Verify low flow alarm is initiated at local control panel and/or BAS head end and boiler shuts down.
g. Repeat steps e and f for each lag boiler.
h. Return all boilers to normal operating conditions.
i. With lead boiler ON in occupied mode (adjust hot water temperature set point if necessary), lower high temperature limit set point to be below current hot water temperature reading.
j. Verify boiler shuts down and alarm is initiated at local control panel and/or BAS head end and boiler shuts down.
k. Repeat steps i and j for each lag boiler.
l. Return all boilers to normal operating conditions.
m. With lead boiler ON in occupied mode (adjust hot water temperature set point if necessary), jump or remove wires or close gas valve, as appropriate, to simulate an unsafe gas condition.
n. Verify boiler shuts down and alarm is initiated at local control panel and/or BAS head end and boiler shuts down.
o. Repeat steps m and n for each lag boiler.
p. Return all boilers to normal operating conditions.
q. With lead boiler ON in occupied mode (adjust hot water temperature set point if necessary), locate and trip EPO (Emergency Power Off) switch.
r. Verify boiler goes into emergency shutdown operations, an audible alarm is sounded in room, and an alarm is initiated at local control panel and/or BAS head end.
s. Return all boilers to normal operating conditions.

7. *STEAM*
   a. *Repeat all procedures listed for hot water boiler applications. Modify tests to accommodate regulation and monitoring of steam pressure in lieu of hot water temperature and ensure a high pressure limit alarm sequence is included within the Alarms and Safeties tests.*
8. *FULLY MODULATING BURNERS*
   a. *Repeat all procedures listed for hot water boiler applications. Modify tests to accommodate fully modulating burners by adapting stage steps to coincide with boiler management system capacity percentages provided by manufacturer.*

Results

Hot Water Temperature Reset:

Outside Air Temperature #1: _____
Heating Water Setpoint #1: _____
Outside Air Temperature #2: _____
Heating Water Setpoint #2: _____

Hot water temperature setpoint adjusts proportionally with increases/decreases with outside air temperature?

YES NO

Staging Up:

Starting HWS Temperature: _____
Starting HWR Temperature: _____

Boiler Tag						
Time Boiler Started:						
HWR Temperature at Low Fire Start:						
HWS Temperature at High Fire Start:						

Time Setpoint Reached: _____

Staging Down:
Starting HWS Temperature: _____
Starting HWR Temperature: _____

Boiler Tag:						
HWR Temperature at Low Fire Start:						
HWS Temperature at Boiler Shut Down:						
Time Boiler Shut Down:						

Time All Boilers Shut Down: _____

Boiler circulation pumps do not de-energize until 30 seconds after associated boiler has shut down?
YES NO

Minimum Boiler Flow (primary pumping systems ONLY):

Boiler Tag:						
Boiler maintains minimum flow with all loads bypassed or isolated?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Boiler maintains minimum flow with all 2-way valved loads isolated and all 3-way valved loads open to load?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

Unoccupied Mode:
Boilers do not fire when placed into unoccupied mode? YES NO
Boilers fire when load is sensed on hot water system during unoccupied mode? YES NO

Alarms and Safeties:

Boiler Tag:						
Lead/lag operation for boiler is operational and acceptable?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Low flow alarm sequence is operational and acceptable?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
High temperature limit sequence is operational and acceptable?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Flame failure sequence is operational and acceptable?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
EPO switch sequence is operational and acceptable?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

Conclusion
Acceptable Criteria: Hot water temperature reset schedule adjusts hot water temperature setpoint in proportion to outside air temperature per contract documents. Boiler staging and firing corresponds to designated heating sequence for facility with minimal hunting. Whereas minimal hunting corresponds to hot water temperature readings differ from hot water temperature set point by no more than ±2°. All alarm and safeties operate per specified sequence and initiate appropriate alarm conditions at local control panel and/or BMS head end.

Comments:

Observations:

Final Status: ❑ Accepted ❑ Not Accepted

Relevant Trend Data
Boiler status, HWS temperature, HWR temperature, HWS setpoint, pump status, outside air temperature.

Witnesses

Name	**Signature**

END OF SECTION

SECTION 01 88 00
INDOOR AIR QUALITY DURING AND AFTER CONSTRUCTION

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes general procedural requirements for compliance with USGBC LEED credits pertaining to Construction Indoor Air Quality Management.

B. Related Sections:

1. Division 01 Section "LEED Requirements" for requirements of LEED certification.

1.03 CONSTRUCTION MEASURES TO MAINTAIN ACCEPTABLE INDOOR AIR QUALITY

A. General

1. Referenced Standard: SMACNA publication "IAQ Guidelines for Occupied Buildings Under Construction", 1995 edition. Portions of the referenced standard apply only to renovation projects, but the general concepts of controlling construction practices to influence indoor air quality are applicable to the Project.
2. The Contractor shall prepare and submit their own IAQ plan for review, to indicate their understanding of the intent and to show how the intentions will be implemented in practical terms. Each of the concepts and particulars in this specification shall be identifiable in the Contractor's plan. The plan shall be reviewed and approved prior to implementation.
3. The plan shall meet the requirements of the Owner, the Commissioning Agent, the Contracting Officer, the Mechanical Engineer, and the LEED consultant.
4. This section contains some supplements to the SMACNA Guideline which add to the requirements, with the intent of improving Indoor Air Quality (IAQ).

B. Dust Control

1. Sources of dust are numerous and inevitable on a construction site; some of the most notable sources are drywall sanding, concrete cutting, masonry work, wood sawing, insulating, etc. The Contractor plan shall include the following:
   a. Identify all sources of dust.
   b. Protect the HVAC systems by keeping the dust out of the ducts, liner, diffusers, fans, VAV boxes, etc. The most dust-susceptible HVAC air paths are the return system and plenums. For stored equipment, this includes storing ducts and equipment away from dust-producing areas, wrapping terminal units in plastic, capping duct sections in plastic. For equipment and ducts and grilles installed, this includes protective caps on ducts and plastic wraps on equipment and grilles already in place before the dust producing process begins. Installation of new HVAC equipment and ductwork with open ends shall not occur simultaneously with dust producing work. Special consideration will be given to protecting duct liner, lined equipment or pre-fabricated lined duct sections, since the liner surface is difficult to clean after contamination. In areas where ductwork is being assembled, raised, or installed, ends and open areas of duct shall be protected when daily work is complete.
   c. Air handlers shall not be used during construction except where absolutely necessary and only with Owner's permission and after protective measures have been taken including
      i. Filter upgrades: install construction filters with minimum ASHRAE 52.1

rating of 80-85% / ASHRAE 52.2 rating of MERV 13, and change weekly if used during construction.

ii. Permanent filters shall be minimum ASHRAE 52.1 rating of 80-85% / ASHRAE 52.2 rating of MERV 13.

iii. Use outside air in lieu of recirculating potentially dirty/dusty air. Use of return air requires Owner and Engineer approval.

iv. If 100% outside air cannot be used, then filtering the return grilles is required, using filters with minimum ASHRAE 52.1 rating of 35-40% / ASHRAE 52.2 rating of MERV 8. Replace the filter media after one week of installation, or when visibly dirty on the outer layer, whichever comes first.

v. Recording the dates and times the units are run.

C. Moisture Control

1. Sources of moisture contamination are numerous and inevitable on a construction site and include precipitation, air intakes, cleaning procedures, flushing procedures, testing procedures, etc. The Contractor plan shall include the following:

a. Identify all sources of moisture, and methods to keep materials from getting wet.

b. Galvanized ductwork that becomes wet or damp shall be dried and any residue removed from surface. Any ductwork that cannot be sufficiently cleaned to remove residue from moisture shall be removed from job site and replaced with new.

c. Porous or absorptive materials, including gypsum wall board, insulation, ceiling tiles, carpeting, etc. that become damp or wet shall be dried immediately; and any of these materials that remain wet or damp for more than 4 hours will be replaced with new materials. Special consideration will be given to protecting duct liner, lined equipment or pre-fabricated lined duct sections, since the liner is difficult to dry out after contamination.

i. An exception to this is glued down carpeting; in this case, if found wet in the morning, the carpeting may be re-used if it is immediately professionally cleaned and sanitized (to kill the bacteria and reset the 4 hour timer) and vacuumed so that it is dry within 4 hours of cleaning.

d. Any materials found to have mold or mildew odors shall be replaced with new materials.

D. VOC Control

1. Comply with Division 01 "Sustainable Design Requirements".

2. Sources of VOC contamination are numerous and inevitable on a construction site and include paints, sealers, adhesives, caulking, cleaners, insulation, carpeting, furniture, etc. The contractor plan shall include the following:

a. Identify all sources of VOC's to properly manage and sequence their use consistent with this specification and LEED requirements.

b. Highly absorbent materials (ceiling tiles, gypsum wall board, fabric furnishings, carpet and insulation, for example) will act as 'sinks' for VOCs, odors and other contaminants. Where possible, install or apply VOC-emitting products BEFORE installing absorbent materials. To mitigate the effects of VOC's, the Contractor's schedule should provide for installation of absorbent materials AFTER applications of odorous, VOC-emitting or other contaminating materials, and an open-air flushing period after construction and prior to occupancy. Ceiling tiles shall be stored and installed after VOC bearing paint, carpet, etc. is installed, and after Testing and Balancing work is completed, except where Test and Balance work requires the ceiling tiles to be in place.

c. Flush the building with 100% outside air at least 48 hours prior to occupancy,

after all application of VOC producing items has been completed.

E. HVAC Equipment and Systems

1. Store air-side equipment in a clean and dry location. Where factory packaging or wrapping is used, maintain this wrapping as long as practical for its protective quality.
2. Ductwork shall be capped with plastic and tape, prior to use, and at the end of each work day. Also, when dust producing processes occur in the area of duct installation, the duct installation shall be halted and the ducts capped until that work is completed, e.g. any drywall installation work that requires cutting, sanding, shaping, or mudding and taping.
3. Ceiling installation shall be scheduled so that it is substantially the last thing to go up, thereby inherently keeping the above-ceiling areas free from construction dust and debris.
4. The use of ventilation systems and air movers during construction will normally be limited to 100% outside air (not recirculating). If special circumstances require recirculation, then special provisions shall be made to protect the return system from contamination including filtering each return air point, and notifying the Owner, the Commissioning Agent, the Mechanical Engineer, and the LEED consultant that the return system needs to be used temporarily. In all cases, the use of the air handling units during construction will have a pre-requisite of upgraded filters to protect the coils and the supply ducts. Air circulation through the return system during construction is not allowed without prior Owner, the Commissioning Agent, the Mechanical Engineer, and the LEED consultant approval and protective measures noted. Verify with Owner that warranty will not be jeopardized or time period shortened as a result of running the air handlers during construction. Extend warranty period as required.
5. Liner edges will be treated to prevent raw fiberglass edges from contacting the air stream, including longitudinal seams, butt joints, at turning vanes, fire dampers, and other transitions to externally insulated ducts. The method used to encapsulate the raw edges will be either nosing, mastic, or other approved sealer per the Engineer's specifications.
    a. This requirement applies to lined ducts and lined equipment, including packaged HVAC equipment, VAV boxes, etc.
6. Adjacent Occupied areas of the building shall be protected from contamination during the construction period. Methods and means used to achieve this will vary, but may include plastic sheeting, temporary walls and doors, negative pressure fans, etc. Regardless of methods, the requirement and intent is to protect existing people, equipment, lighting, furnishings, return plenums etc. from the construction dust, VOC's, moisture, and other undesirable effects from the construction work.
7. If equipment, materials, ductwork, plenums, or building areas are not properly protected and contamination does occur, then remedial work will be required to wash, clean, replace, or restore the adjacent areas to a suitable condition, equal to its original state.
8. Determination of what is "dirty" will be based on a simple wipe of the surface with or finger. If there is sufficient dust on the surface to allow writing to be visible through the dust, then the item shall be considered dirty and will need to be cleaned.

F. Remedial Work

1. Where methods and means do not achieve the intent and requirements of this specification, provide remedial work to clean or replace contaminated equipment, materials, ducts, and adjacent occupied areas as required.
2. If duct cleaning is required, provide access openings as required to thoroughly clean the ducts, including ducts, dampers, turning vanes, plenums, shafts, etc.
3. All remedial work and cleaning activities shall be pre-approved by the Owner, [the Commissioning Agent, the Contracting Officer, the Mechanical Engineer, and the

LEED consultant before commencing with the work.

4. Ductwork cleaning shall be by a professional duct cleaning company, using either mechanical brushes and a HEPA vacuum, or soap and water.
5. Plenum cleaning shall be by a professional duct cleaning company, using a HEPA vacuum.
6. Contaminated insulation, liner, wall board, ceiling tiles, and other porous or soft materials shall be cleaned with a HEPA vacuum or replaced, at the discretion of the Owner, [the Commissioning Agent, the Contracting Officer, the Mechanical Engineer, and the LEED consultant.
7. Other means of remediation, including encapsulation may be proposed and may be accepted, at the discretion of the Owner, the Commissioning Agent, the Contracting Officer, the Mechanical Engineer, and the LEED consultant.

G. Commissioning Agent Quality Control Steps

1. The Commissioning Agent shall review of the Contractor's written procedures for providing good IAQ in the completed construction project.
2. The Commissioning Agent shall spot check the IAQ procedure implementation, looking for visible signs of dust contamination on and in HVAC systems (including equipment, ducts, plenums).
3. The Commissioning Agent shall look for and smell for visible signs of water contamination of porous materials (including equipment, carpet, ceiling tiles, walls, etc.).
4. The Commissioning Agent shall note and/or photograph locations where IAQ concerns are found.
5. The Commissioning Agent shall make recommendations and discuss options with the contractor for remedial work, if required.
6. The Commissioning Agent shall verify that specified filters are utilized, including special filter requirements for operating HVAC equipment during construction.
7. The Commissioning Agent shall verify that permanent filters utilized in air handlers are as follow (minimum): ASHRAE 52.1 rating of 80-85% / ASHRAE 52.2 rating of MERV 13.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01 91 00

COMMISSIONING PROCESS

PART 1 - GENERAL

SCOPE

This section includes specifications for the implementation, tracking and verification of the commissioning process. This project will seek Fundamental Commissioning in the LEED 2009 For New Construction and Major Renovations. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Definitions
- Submittals
- Communication
- Commissioned Systems
- Contractor Involvement
- Responsibilities

PART 2 - PRODUCTS
- Test Equipment

PART 3 - EXECUTION
- Purpose
- Commissioning Plan
- Scheduling
- Submittal Reviews
- Construction Verification Items
- Start-up Verification
- Testing Verification
- As-Built Verification
- Site Visits
- Commissioning Meetings
- Testing Adjusting and Balancing Verification
- Functional Performance and Seasonal Testing
- Operation and Maintenance Data
- Training and Demonstration
- Warranty Review
- Commissioning Record
- Commissioning Issues

RELATED WORK

Section 01 78 23 – Operation and Maintenance Data
Section 01 79 00 – Training and Demonstration
Section 01 78 13 – Construction Verification Items
Section 01 86 00 – Functional Performance Testing
Division 23 – Heating, Ventilating and Air-Conditioning
Division 26 – Electrical

REFERENCE

Applicable provisions of Division 1 govern work under this section.

DEFINITIONS

A/E: Architect / Engineer
Cx: Commissioning
CxP: Commissioning Provider
O&M: Operations and Maintenance

P/T: Pressure / Temperature
BAS: Building Automation System
TAB: Testing, Adjusting, and Balancing
OPR: Owner's Project Requirements
RFC: Request for Clarification
FPT: Functional Performance Tests
RFI: Request for Information
CO: Change Order

SUBMITTALS

A. The following table contains deliverables and/or submittals required under this section, the party(s) responsible for each, the frequency and or timeline these items should be provided, the format and quantity to be provided, and the party(s) to be provided to.

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
Draft commissioning plan	CxP	2 days prior to commencement of work	Electronic	Contractor and Owner
Commissioning plan updates	CxP	Monthly	Electronic	Contractor, A/E and Owner
Draft construction schedule	Contractor	1 week prior to commencement of work	Electronic	CxP
Commissioning milestones for construction schedule	CxP	Within 5 business days of receipt of schedule	Electronic	Contractor
Updated construction schedule	Contractor	Weekly	Electronic	CxP
Submittal register	Contractor	1 week prior to commencement of work	Electronic	CxP
Submittal log	Contractor	Weekly	Electronic	CxP
Submittals	Contractor	Concurrent with submissions to A/E	Electronic	CxP
Submittal review comments	CxP	Within 5 business days of receipt of submittal	Electronic	A/E
A/E submittal review comments/approval	A/E	Within 10 business days of receipt of submittal	Paper (as specified under GENERAL CONDITIONS)	CxP and Contractor
Notification of equipment and/or system start-up	Contractor	Within 5 business days prior to scheduled start-up	Electronic	CxP and A/E
Equipment and/or system start-up reports	Contractor	Within 5 business days of start-up	Electronic	CxP and A/E
Notification of specified testing for commissioned systems (FPT excluded) and procedures	Contractor	Within 5 business days prior to scheduled test	Electronic	CxP and A/E

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
Specified testing reports for commissioned systems	Contractor	Within 5 business days of testing	Electronic	CxP and A/E
Draft as-builts	Contractor	Within 14 days prior to scheduled training	Paper (2 copies)	A/E and Owner
Final as-builts	A/E	Within 60 days of substantial completion	Electronic and Paper (1 copy)	Owner
Commissioning site visit log	CxP	Within 5 business days of receipt of construction schedule	Electronic	Contractor
Notification of commissioning site visit	CxP	5 business days prior to site visit	Electronic	Contractor
Site visit report	CxP	Within 5 business days of site visit	Electronic	Contractor, A/E and Owner
Resolution report for site visit issues	Contractor	Within 10 business days of receipt of site visit report	Electronic	A/E, CxP and Owner
Notification of commissioning meeting and agenda	CxP	5 business days prior to meeting	Electronic	Contractor
Commissioning meeting minutes	CxP	Within 5 business days of meeting	Electronic	Contractor, A/E and Owner
TAB plan	Contractor	90 days prior to scheduled start date	Paper (as specified under GENERAL CONDITIONS)	CxP and A/E
TAB plan review comments	CxP	Within 5 business days of receipt of plan	Electronic	A/E
A/E TAB plan review comments/approval	A/E	Within 10 business days of receipt of plan	Paper (as specified under GENERAL CONDITIONS)	CxP and Contractor
TAB report	Contractor	Within 5 business days of TAB	Paper (as specified under GENERAL CONDITIONS)	CxP and A/E
TAB report review comments	CxP	Within 5 business days of receipt of report	Electronic	A/E
A/E TAB report review comments/approval	A/E	Within 10 business days of receipt of report	Paper (as specified under GENERAL CONDITIONS)	CxP and Contractor

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
TAB verification report	CxP	Within 5 business days of TAB verification	Electronic	Contractor, A/E and Owner
Operation and maintenance data draft submittal	Contractor	60 days proceeding submittal approval	Paper (as specified under OPERATION AND MAINTENANCE DATA)	CxP, A/E and Owner
O&M data review comments	CxP	Within 5 business days of receipt of submittal	Electronic	A/E
A/E O&M data review comments/approval	A/E	Within 10 business days of receipt of submittal	Paper (as specified under GENERAL CONDITIONS)	CxP and Contractor
Operation and maintenance data final submittal	Contractor	60 days prior to scheduled training	Paper (as specified under OPERATION AND MAINTENANCE DATA)	CxP, A/E and Owner
Draft training program	Contractor	120 days prior to substantial completion	Electronic	CxP, A/E, and Owner
Draft training program review comments	CxP	Within 5 business days of receipt of program	Electronic	A/E
A/E draft training program review comments/approval	A/E	Within 10 business days of receipt of program	Paper (as specified under GENERAL CONDITIONS)	CxP and Contractor
Training session evaluation forms	CxP	90 days prior to scheduled training	Electronic	Contractor
Training materials	Contractor	60 days prior to scheduled training	Electronic	CxP and A/E
Training materials review comments	CxP	Within 5 business days of receipt of program	Electronic	A/E
A/E training materials review comments/approval	A/E	Within 10 business days of receipt of program	Paper (as specified under GENERAL CONDITIONS)	CxP and Contractor
Training session notifications	Contractor	2 days prior to scheduled session	Electronic	CxP and Owner
Completed training sessions record and evaluation forms	Contractor	Within 2 business days of sessions	Paper (1 copy)	CxP and A/E
Training session review comments and recommended action	CxP	Within 5 business days of sessions	Electronic	CxP

Submittal	Party(s) Responsible	Frequency or Timeline	Format & Quantity	Party(s) Provided To
A/E training session review comments/approval	A/E	Within 10 business days of session	Paper (as specified under GENERAL CONDITIONS)	CxP and Contractor
Training session videos	Contractor	Within 30 days of completion of training	Electronic	CxP, A/E and Owner
Warranty coverage and requirements per equipment and/or system	Contractor	Within 60 days of scheduled training	Paper (as specified under GENERAL CONDITIONS)	CxP, A/E and Owner
Warranty review report	CxP	Within 5 business days of site visit	Electronic	Contractor, A/E and Owner
Warranty review A/E action statement	A/E	Within 5 business days of receipt of report	Paper (as specified under GENERAL CONDITIONS)	Contractor
Warranty resolution report	Contractor	Within 5 business days of completion of work	Paper (as specified under GENERAL CONDITIONS)	CxP, A/E and Owner
Draft commissioning record	CxP	Within 10 business days of substantial completion	Electronic	Contractor, A/E and Owner
Final commissioning record	CxP	Within 10 business days of substantial completion	Electronic	Contractor, A/E and Owner
Commissioning issues report	CxP	Monthly	Electronic	Contractor, A/E and Owner
Resolution report for commissioning issues	Contractor	Within 10 business days of receipt of issues report	Electronic	CxP

COMMUNICATION
Communication resulting from or in relation to commissioning activities will be relayed directly to the responsible party whenever possible, with copies to the Owner, A/E and Contractor.

COMMISSIONED SYSTEMS
Commissioned systems is defined as the equipment and/or systems pertaining to the sections defined under RELATED WORK for this section.

CONTRACTOR INVOLVEMENT

A. Contractor is required to assist in the commissioning process defined within this section and those sections noted under RELATED WORK.
B. Contractor shall ensure that proper access for the CxP is provided to their personnel for communication and assistance in the commissioning efforts. This shall include designating a single point of contact for the commissioning efforts.
C. Contractor shall attend all specified and requested meetings by CxP, including the attendance of any additional personnel noted by the CxP.
D. CxP has no authority to change the contract or direct the Contractor in any of their work, only to provide comments and suggestions. Issues that cannot be resolved between the

Contractor and CxP will be jointly presented to the Owner for resolution according to the terms specified under ISSUE RESOLUTION.

RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. The responsibilities listed for Contractor apply to all contractors related scope defined under RELATED WORK, as well as any sub-contractors, consultants and/or personnel under the employment of the Contractor. It is noted that the services for the Project Manager, Construction Manager, Architect, Contractor, and CxP are not provided for in this contract. That is, the Contractor is not responsible for providing their services. Their responsibilities are listed here to clarify the commissioning process.

B. All Parties
   1. Follow the Commissioning Plan.
   2. Attend commissioning pre-construction meeting and additional meetings, as necessary.

C. A/E
   1. Review and approve submittals, O&M data, training program and as-builts in accordance with contracted services.
   2. Provide any design narrative documentation requested by the CxP. This includes clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
   3. Attend the commissioning pre-construction meeting and selected additional commissioning meetings.
   4. Review TAB plan and report.
   5. Coordinate resolution of system deficiencies and discrepancies identified during commissioning, according to the contract documents.
   6. Prepare and submit final as-built basis of design and owner project requirements documentation for inclusion in the O&M data.
   7. Prepare and submit final as-built one line system diagrams and narratives for inclusion in the O&M data.
   8. Coordinate resolution of design non-conformance and deficiencies identified during warranty-period commissioning.

D. CxP
   1. The CxP is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxP may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the Contractor and A/E. The primary role of the CxP is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented intention of design and in accordance with the Contract Documents. Contractor will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which, if determined by the CxP to be required, shall be supplied and installed by the CxP.
   2. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
   3. Prepare and maintain commissioning plan.
   4. Prepare and update commissioning milestones and schedule.
   5. Coordinate the commissioning work and, with Contractor, verify that commissioning activities are being scheduled into the master schedule.
   6. Coordinate and facilitate pre-construction commissioning meeting and commissioning meetings as required.
   7. Request and review additional information required to perform commissioning tasks, including O&M data, contractor start-up and checkout procedures.
   8. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
   9. Plan and conduct a commissioning pre-construction meeting and other commissioning meetings.

10. Develop construction checklists and provide Contractor with final checklists in approved format with accompanying tracking system.
11. Provide equipment identification tags specified under 00 63 00.
12. Provide Contractor with training in relation to use of checklists and tracking system.
13. Provide Contractor with itemized list detailing checklist items requiring action.
14. Before startup, review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
15. Perform site visits, as contracted, to observe equipment and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
16. Witness part of the additional testing specified for the commissioned systems, in sufficient detail to be confident that proper procedures were followed. Review the reports prepared by the Contractors to document the testing procedures. Notify A/E and Owner of any deficiencies in results or procedures.
17. Review construction checklist completion by reviewing construction checklist completion reports and by selected site observation and spot checking. Advise Contractor of status of construction checklist completion and discrepancies identified.
18. Review and witness a sampling of equipment start-up and reports, in sufficient detail to be confident of results and procedures followed.
19. Review a sampling of as-built drawings, in sufficient detail to be confident of validity and accuracy of the documentation.
20. Review TAB plan and report.
21. Verify air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
22. Prepare and provide contractor readiness criteria to Contractor.
23. Analyze any functional performance trend logs and monitoring data to verify performance.
24. Witness and document manual functional and seasonal tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
25. Maintain a master deficiency and resolution log and a separate testing record. Provide Contractor with written progress reports and test results with recommended actions.
26. Review equipment warranties to verify that the Owner's responsibilities are clearly defined.
27. Review the training of the Owner's operating personnel per contract.
28. Compile and maintain a commissioning record.
29. Review the preparation of the O&M data.
30. Coordinate and facilitate warranty review with Owner staff and provide formal report of findings to A/E and Contractor.
31. Develop and maintain commissioning record.

E. Contractor
1. Facilitate the coordination of the commissioning work by the CxP, and with other contractors.
2. Include the cost of commissioning in the total contract price.
3. Verify that commissioning activities are being scheduled into the master schedule.
4. Attend a commissioning pre-construction meeting and other commissioning meetings as requested.
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CxP.
6. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
7. Ensure that all sub-contractors and personnel execute their commissioning responsibilities according to the Contract Documents and schedule.
8. Review construction verification checklists provided in specifications, prior to commencement of work.
9. Provide hardware and software specified under 01810 for use with checklist tracking system provided by CxP.

10. Complete checklists for sections responsible for, according to procedures specified under 01810.
11. Distribute required checklist tracking reports to parties and at durations specified under 01810.
12. Resolve and provide resolution reports for all checklist deficiencies noted by CxP.
13. Resolve and provide resolution reports for all checklist discrepancies noted by CxP.
14. Review and approve the functional performance test procedures submitted by CxP.
15. Provide CxP functional and seasonal testing plan in accordance with procedures supplied under this section.
16. Provide CxP with contractor readiness notification.
17. Facilitate and assist CxP as necessary in the functional and seasonal testing of selected equipment and systems.
18. Ensure sub-contractors and personnel facilitate and assist CxP as necessary in the functional and seasonal testing of selected equipment and systems.
19. Review commissioning progress and deficiency reports.
20. Coordinate and facilitate the resolution of non-compliance, deficiencies and discrepancies identified in all phases of commissioning.
21. Ensure sub-contractors and personnel coordinate and facilitate the resolution of non-compliance, deficiencies and discrepancies identified in all phases of commissioning.
22. Coordinate and facilitate the training of Owner personnel.
23. Prepare O&M data, according to the Contract Documents, including clarifying and updating Contract Documents to as-built conditions.

F. Equipment and Material Suppliers
1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Contractor.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by CxP.
4. Through the Contractor they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.
5. Provide information requested by CxP regarding equipment sequence of operation and testing procedures.
6. Review and approve test procedures for equipment installed by factory representatives.

G. Owner
1. Attend the commissioning pre-construction meeting and selected additional commissioning meetings.

PART 2 – PRODUCTS

TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout, additional testing and required functional performance testing shall be provided by Contractor for the equipment being tested.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CxP.

C. Datalogging equipment and software required to test equipment, if used, will be provided by the CxP, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply:
1. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or – 0.1°F.
2. Pressure sensors shall have an accuracy of + or – 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

3. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 – EXECUTION

PURPOSE

A. Commissioning is a systematic process of assess whether all commissioned systems perform interactively according to the owner's project requirements and the intention of the design, and to track the process by which any deviations from this performance are addressed. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance.
B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning facility.

COMMISSIONING PLAN

A. CxP shall develop a complete commissioning plan detailing the following information at a minimum:
   1. Contact information for key members of commissioning team.
   2. Description of procedures to be utilized for each commissioning task.
   3. List of commissioned systems and associated equipment.
   4. Sampling approach to be utilized for each equipment and system type by commissioning task.
   5. List of responsibilities for each party involved in the commissioning process.
   6. Commissioning milestones and schedule.
   7. Record of results for commissioning tasks to date.
B. CxP shall provide an initial copy of the commissioning plan to Contractor 2 days prior to commencement of work, and shall provide updates to this plan at the intervals and format defined under SUBMITTALS for this section.

SCHEDULING

A. Contractor to provide CxP with a draft construction schedule 1 week prior to commencement of work.
B. Contractor to provide CxP with updates to construction schedule based upon activities to date in regular intervals, where regular interval is defined at a minimum of monthly.
C. CxP shall provide Contractor detailed list of commissioning milestones and task schedule within 5 business days of receipt of initial and subsequent construction schedules.
D. Contractor to provide a minimum of 5 business days notice to CxP with regards to the following activities unless specifically stated otherwise within another section of the specifications:
   1. Equipment or system start-up
   2. Specified testing other than FPT
   3. Cancellation of activity requiring CxP attendance

SUBMITTAL REVIEWS

A. Contractor shall supply one complete copy of the submittal register in electronic format to CxP 1 week prior to commencement of work. Register shall include at a minimum the following:
   1. Specification section number
   2. List of equipment, system, materials, certifications and/or reports requiring submittals for each specification section
   3. Number of submittals anticipated for each specification section
B. Contractor to supply one copy, in electronic format of each submittal required for the sections listed under RELATED WORK of this section to CxP concurrently with A/E submission. This shall include but is not limited to:
   1. Equipment and system shop drawings
   2. Coordination drawings
   3. RFIs

4. COs
5. RFCs

C. All submittals supplied by Contractor shall comply with requirements specified under 01330 and those listed within the technical specifications sections, but not less than the following:
   1. Submittals shall show evidence of review and approval by Contractor to ensure compliance to contract documents.
   2. Submittals shall be marked to show exact items, sizes, components, characteristics, quantities and details required for project.
   3. Submittals shall be properly annotated to match drawing schedules.
   4. Catalog information provided shall be clearly marked to indicate intended item and options.
   5. Submittals shall contain a complete and edited copy of the manufacturer's installation and O&M manuals for the proposed equipment and/or system, including wiring diagrams, troubleshooting procedures, parts list and preventative maintenance instructions.
   6. Submittals shall include manufacturer's typical start-up checklist, report, and/or procedures for the proposed equipment and/or system.
D. Upon receipt CxP shall review submittal in parallel with A/E review and provide comments to the A/E for inclusion in their final comments to Contractor within 5 business days.
E. A/E shall provide Contractor and CxP with single collated comments and action for submittal within 10 business days of receipt of submittal and in the format and quantity specified under 01330.
F. CxP shall review only one re-submittal per submittal provided by Contractor. If additional re-submittals are required due to Contractor negligence in resolution of issues provided by CxP or A/E, then Contractor shall be back charged by Owner for each subsequent re-submittal review by A/E and CxP.

CONSTRUCTION VERIFICATION ITEMS

See section 01820 – Construction Verification Items.

START-UP VERIFICATION

A. Contractor shall notify CxP and A/E within 5 business days prior to equipment or system start-up for a commissioned system.
B. CxP and A/E shall witness equipment or system start-up as deemed necessary.
C. Contractor to supply one copy of the start-up report to CxP and A/E within 5 business days of start-up.

TESTING VERIFICATION

A. For all commissioned systems, Contractor shall notify CxP and A/E within 5 business days prior to any testing specified under technical section for a given equipment or system within the commissioned system. Notification shall include a copy of the proposed procedures to be utilized in electronic format.
B. CxP and A/E shall witness additional testing as deemed necessary.
C. Contractor to supply one copy of the test report to CxP and A/E within 5 business days of testing.

AS-BUILT VERIFICATION

A. Contractor shall maintain on site and up to date one copy of project as-builts per the requirements of GENERAL CONDITIONS.
B. As-built drawings shall be of sufficient detail to clearly indicate any and all deviations from design, including items modified per RFC, RFI or CO.
C. As-built drawings maintained by Contractor will be periodically reviewed and verified during construction by CxP. Discrepancies in the drawings will be documented in site visit reports and the Contractor shall be responsible to verify and correct the as-built drawings against the installed system for specified and all similar problems noted.
D. Contractor shall supply draft copy of complete as-builts to A/E and Owner within 14 days prior to initial training session.

SITE VISITS

A. Within 5 business days of receipt of construction schedule CxP shall provide Contractor with site visit log detailing the number, dates and scope of commissioning site visits anticipated for the duration of the project. This log shall be maintained by .CxP and shall be updated and provided to Contractor at each construction schedule update.
B. CxP shall notify Contractor 5 business days prior to a scheduled site visit for confirmation of schedule and scope of site visit. Notification shall include the following items at a minimum:
    1. Date of site visit
    2. Activities to be performed for site visit
    3. Areas and system to reviewed during site visit
    4. CxP personnel to be in attendance
C. Site visits by CxP shall consist of at least one of the following activities, with the actual scope of activities to be clearly defined within the site visit log and notification of site visit to Contractor:
    1. Verification of construction checklists
    2. Start-up verification
    3. Testing verification
    4. As-built verification
    5. General review of progress and quality
    6. Meeting attendance
    7. Commissioning meeting
    8. Attendance of Owner training session
    9. TAB verification
    10. Witness of functional performance testing
D. Contractor shall ensure that personnel related to activities, areas and systems scheduled for a given site visit by CxP are readily available for questions and/or assistance to CxP.
E. Within 5 business days of site visit CxP shall provide Contractor and Owner with a clear record of the activities performed for the site visit and any deficiencies, discrepancies or issues identified. Report shall clearly detail the scope and location of the issues identified, including provision of photographs as possible.
F. Within 10 business days of receipt of site visit report Contractor shall supply CxP with a detailed resolution report detailing the following information for issues identified in the site visit report:
    1. Issue number and description
    2. Method of resolution
    3. Date of resolution
    4. Party(s) responsible for resolution
    5. List of similar installations and areas reviewed and resolved

COMMISSIONING MEETINGS

A. Periodically CxP shall call a meeting of Contractor, A/E and Owner to review progress of the project, review issues, and discuss scheduling for future commissioning tasks.
B. To the fullest extent possible CxP shall schedule meetings to occur at times that coincide with existing meetings scheduled for Contractor to minimize downtime of Contractor, sub-contractors and personnel.
C. CxP shall provide notification to all parties requested to attend a specific meeting within 5 business days prior to meeting. Notification shall include a formal agenda of the meeting, including the anticipated duration and attendees required.
D. Contractor, A/E and Owner shall be responsible to have personnel requested in attendance at meeting for duration specified by CxP. If people requested are not available then Contractor, A/E or Owner shall provide notice to CxP and provide a substitute.
E. Within 5 business days of meeting CxP shall supply all attending parties with a formal copy of the minutes for the meeting.
F. Attending parties shall have 5 business days from receipt of minutes to formally comment to CxP on changes to minutes.

TESTING, ADJUSTING AND BALANCING VERIFICATION

A. TAB Plan

1. 90 days prior to TAB, Contractor is to provide A/E and CxP with a complete copy of the TAB plan for the project. TAB plan shall include at a minimum the following information:
   i. Review contract documentation, submittals and installations for each system requiring TAB. Provide comments on any conditions of design and installation that will preclude proper TAB of facility.
   ii. Copy of qualifications and certifications for technicians to be utilized for TAB work.
   iii. Copy of calibration records for all instrumentation to be utilized during course of TAB.
   iv. Step by step procedures detailing the methods to be utilized for balancing of each system and equipment type present. Procedures shall be of sufficient detail to ensure repeatable measurement, as well as include procedures to be utilized for examination and preparation prior to TAB.
   v. Pre-populated TAB report in format specified under 15990 & 15991. TAB report shall include design and submitted performance data for facility equipment and systems.
2. Within 5 business days of receipt of TAB plan CxP shall provide comments to A/E for review and incorporation into the A/E response to the submittal.
3. Within 10 business days of receipt of TAB plan A/E shall provide Contractor with formal response and action for TAB plan.
4. Contractor shall utilize approved TAB plan as basis for all TAB work to be performed on site. CxP shall in turn utilize the TAB plan as the basis for establishment of the TAB verification plan and the body of record for reviewing the procedures utilized by Contractor in the verification of TAB.

B. TAB Report
1. Within 5 business days of completion of TAB, Contractor shall supply A/E and CxP with a complete copy of the TAB report for the facility. Report is to meet the requirements stated in 15990 & 15991 and shall be provided in electronic format.
2. Within 5 business days of receipt of TAB report CxP shall provide comments to A/E for review and incorporation into the A/E response to the submittal.
3. Within 10 business days of receipt of TAB report A/E shall provide Contractor with formal response and action for TAB report.
4. If any deficiencies are noted in TAB report comments from the A/E that are related to the methods utilized or results of TAB, Contractor shall remedy said issues and inform A/E and CxP of completion.

C. TAB Verification
1. A minimum verification sample of 10% of total the points defined under the work of TAB shall be included for TAB verification. CxP shall define the overall sampling approach and rate to be utilized for TAB verification.
2. Contractor shall supply all personnel and equipment necessary to fully implement TAB verification as requested by CxP.
3. Within 10 business days of TAB verification CxP shall provide A/E, Owner and Contractor with formal TAB verification report. Report shall include at a minimum the following:
   i. Names of personnel in attendance
   ii. Date and duration of verification
   iii. Lists of areas and equipment sampled
   iv. TAB report and verification values for each point sampled, including tolerances
   v. List of deficiencies and discrepancies noted during verification with recommendations for resolution
   vi. Discrepancy rate by system, whereas discrepancy rate is defined as the number of points with measured values outside of the tolerances defined divided by the total number of points for a given system
   vii. Overall recommendation for approval of TAB by system
4. If a discrepancy rate >10% is identified for a given system during TAB verification, Contractor shall be responsible for re-balancing said system in total. In addition, Contractor shall be back charged by Owner for CxP to perform an additional verification of said system.

FUNCTIONAL PERFORMANCE AND SEASONAL TESTING
See Section 01825 – Functional Performance Testing

OPERATION AND MAINTENANCE DATA

A. Submittal
   1. Contractor shall supply one copy of O&M data in format defined to the CxP 60 days proceeding submittal approval.
   2. Within 5 business days of receipt of O&M data CxP shall provide A/E with comments or review and incorporation into A/E comments and action for submittal.
   3. Contractor shall make revisions noted in A/E formal response and provide one copy of the final O&M data to the CxP 60 days prior to scheduled training:
   4. Any revisions or changes to the systems and/or equipment post delivery of the final O&M data submittal must be submitted to CxP as an addendum item. Any such submittal must adhere to specifications and be delivered within 30 days of the revision or change.

TRAINING AND DEMONSTRATION

A. Contractor shall be responsible to submit a formal training program per 01785 to be utilized for each respective system under their responsibility 120 days prior to substantial completion to CxP.
B. Within 5 business days of receipt of training program CxP shall supply A/E with comments or review and incorporation into A/E comments and action for submittal.
C. 90 days prior to initial scheduled training session CxP shall supply Contractor with formal evaluation forms to be provided to attendees for evaluation of each session.
D. 60 days prior to initial scheduled training session Contractor shall submit training materials per 01785 to be utilized for all sessions under there responsibility to CxP. These materials shall include at a minimum the following:
E. Within 5 business days of receipt of training materials CxP shall supply A/E with comments or review and incorporation into A/E comments and action for submittal.
F. 2 days prior to scheduled training session Contractor shall notify CxP of confirmation for training session.
G. Training records and evaluation forms must be submitted to CxP within 2 business days of completion of training session.
H. CxP shall attend and review portions of the training sessions to verify that the training program was followed. CxP shall provide comments and recommendation for action for each session attended to A/E within 5 business days of session. Any sessions deemed as unacceptable or rejected shall be re-done and taped at the convenience of the Owner and CxP. Contractor shall be back charged in these instances for the cost of attendance by CxP.
I. Training videos shall be supplied to CxP within 30 days of completion of training.

WARRANTY REVIEW

A. 60 days prior to scheduled training Contractor shall supply a complete copy of all warranties applicable to the facility, the terms of maintenance for each warranty, and the inception and expiration dates for each within the O&M data.
B. Within 10 months of substantial completion CxP shall conduct a review of the operations and condition of the facility with respect to warranty related issues. Within 5 business days of this review CxP shall supply Contractor, A/E and Owner with a detailed report listing the issues identified. This report shall include at a minimum the following:
   1. Description of issue identified, including photographs as applicable
   2. Recommended course of action
   3. Supplementary information relative to previous maintenance or repairs attempted for resolution of issue
C. Within 5 business days of receipt of report A/E shall issue a formal course of action to Contractor for resolution of issues identified.
D. Contractor shall employ services and materials necessary for compliance to action statement from A/E within 14 days of receipt of statement. All repairs and actions taken by Contractor shall be coordinated with Owner, with a formal log of work completed provided to Owner, A/E and CxP within 5 business days of completion of all warranty work.

COMMISSIONING RECORD

A. CxP shall provide Contractor, A/E and Owner a draft copy of the commissioning record for the project within 10 business days of substantial completion. This report shall include at a minimum the following:

1. Table of Contents
2. Executive Summary
3. Contact information for key members of commissioning team.
4. Description of procedures utilized for each commissioning task.
5. List of commissioned systems and associated equipment.
6. Sampling approach utilized for each equipment and system type by commissioning task.
7. List of responsibilities for each party involved in the commissioning process.
8. Record of results for commissioning tasks to date.
9. List of outstanding issues to date.
10. Summarized estimate of cost and savings for commissioning to date, with breakdown of cost and savings by entity. Summary can be a sample of the overall issues resolved to date and does not need a comprehensive estimate of all issues identified.

B. CxP shall provide Contractor, A/E and Owner a final copy of the commissioning record for the project within 10 business days of substantial completion. This report shall include at a minimum the following:
1. Table of Contents
2. Executive Summary
3. Contact information for key members of commissioning team.
4. Description of procedures utilized for each commissioning task.
5. List of commissioned systems and associated equipment.
6. Sampling approach utilized for each equipment and system type by commissioning task.
7. List of responsibilities for each party involved in the commissioning process.
8. Record of results for commissioning tasks.
9. List of outstanding issues.
10. Summarized estimate of cost and savings for commissioning, with breakdown of cost and savings by entity. Summary can be a sample of the overall issues resolved to date and does not need a comprehensive estimate of all issues identified.
11. Recommendations for improvement of commissioning process.

COMMISSIONING ISSUES

A. Throughout the course of the project and commissioning process the CxP shall identify various issues relative to deficiencies or discrepancies with the installations, submissions, or instructions provided by Contractor. These issues shall be clearly identified to Contractor, A/E and other parties of interest in multiple forms depending upon the commissioning task the issue was identified during. However, CxP shall provide on a monthly basis a formalized Cx issues report detailing all issues identified to date and the current status of each issue to Contractor, A/E and Owner.

B. Contractor and A/E are ultimately responsible for resolution of all issues identified during course of project and the commissioning process. However, at a minimum Contractor shall supply CxP a formal resolution report for outstanding issues listed in the Cx issues report within 10 business days of receipt of issues report.

END OF SECTION

SECTION 02 41 00
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 CODES

A. All work shall comply with the applicable requirements of the local building code and accident and fire prevention regulations.

1.02 SCOPE

A. The Work covered by this Section of Specifications includes, but is not limited to, the following:

1. Demolish and remove existing construction materials as shown on the Drawings and noted in the Project Manual and as required for a proper installation.
2. Cover holes and other hazardous openings with approved materials and barriers.
3. Remove all demolition materials and debris from the Project site and dispose of in a legal manner.

B. Protect adequately the Project site, adjoining property, and utility services as work proceeds through all stages.

1.03 QUALITY ASSURANCE

A. Contractor's staff responsible for demolition shall be experienced in this type of work. Equipment is to be of suitable type, in good working condition, and operated by skilled mechanics.

PART 2 - PRODUCTS

2.01 NOT APPLICABLE

PART 3 - EXECUTION

3.01 GENERAL INSTRUCTIONS

A. All work shall be done in a safe and cautious manner in order to avoid accidents and property damage.

B. Protect the work scheduled to remain and, if damaged, repair to match existing work.

C. All salvaged material, unless otherwise noted in Drawings or in the Description of Work, shall become the property of the Contractor and shall be evaluated in the Contractor's bid price. Remove promptly salvaged material from the Project site as the work proceeds.

D. Carefully dismantle and store on site all material scheduled to remain the property of the Owner. Protect until removed by the Owner or until end of Contract.

E. Protect from damage, and clean and overhaul materials scheduled to be reused.

F. Protect parts of the existing work scheduled to remain. Cut away carefully the parts to be demolished to reduce the amount of necessary repairs.

G. Support existing structure as needed during cutting of new openings or replacement of structural members.

H. Prevent accumulation of debris and overloading of any part of the structure.

I. Prevent access of unauthorized persons to partly demolished areas.

J. Remove all demolition materials, debris, and rubbish from the Project site as soon as practicable. Do not permit any accumulation on the Project site. Transport all demolition materials without spillage onto the streets.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMS AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Specified Elsewhere:
   1. Section 03 20 00: Concrete Reinforcement
   2. Section 03 30 00: Cast-In-Place Concrete

B. Work Installed But Furnished by Others:
   1. Built-in anchors, inserts and bolts for connection of other materials.
   2. Built-in sleeves, thimbles, dovetail slots, and water stops.

C. Definitions:
   1. Non-architectural concrete surfaces: Formed surfaces where appearance is not a design consideration.

1.01 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability of successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:
   1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
   2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
   3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.02 QUALITY ASSURANCE

A. Design Criteria:
   1. All formwork is subject to the Architects approval.
   2. The design, engineering, safety, and construction shall be the responsibility of the contractor.
   3. All formwork shall conform to ACI 347, "Recommended Practice for Concrete Formwork", Chapter 1 - Design, for the Loads, Lateral Pressure, and Allowable Stresses as Outlined.
   4. Formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
   5. Side forms of footings may be omitted and concrete placed directly against excavation only when requested by contractor and accepted by Architect. When omission of forms is accepted, provide additional concrete two (2) inches beyond the minimum design profiles and dimensions of the footings as detailed.

B. Requirements of Regulatory Agencies: Erect forms to meet requirements of the State of Wisconsin Building Code and OSHA.

C. Allowable Tolerances:
   1. Non-architectural concrete: conform to ACI 347, Article 3.3.

D. Where a conflict occurs between the standard specified, the more stringent shall govern.

1.03 SUBMITTALS

A. Color options for Wooster nosings at stairs.

B. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.04 PRODUCT DELIVER: STORAGE AND HANDLING

A. On delivery to job site, place materials in area protected from weather.

B. Store materials above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.

C. Handle materials to prevent damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Conform with ACI 347-78 "Recommended Practice for Concrete Formwork", Chapter 4 - Materials for Formwork.

B. Exposed Concrete Surfaces in Finished Structure:

1. Construct formwork with plywood, metal, metal-framed plywood-faced or other panel type materials acceptable to Architect, to provide continuous, straight, smooth exposed surfaces.
2. Formwork shall be mortar - tight and constructed of a material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
3. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
4. Temporary openings may be provided on all walls and forms to limit the free fall of the concrete to less than four feet and should be so located as to facilitate the placing and consideration of the concrete. The ports shall be spaced no more than 6 feet apart to limit the horizontal flow of concrete.

C. Unexposed Concrete Surfaces in Finished Structure:

1. Construct formwork with plywood, board, metal, or other acceptable material.

D. Form Ties and Accessories:

1. Provide factory-fabricated, adjustable-length, removable or snap-off form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
2. Provide ties so that portion remaining within concrete after removal of exterior parts is at least 1-1/2" from the outer concrete surface. Cutting ties back from face of wall or use of wire ties will not be permitted.
3. Ties shall be fitted with tapered rubber plugs and plug holes shall be filled with non-shrink grout after forms are removed where concrete is exposed to view. Where the walls have earth on both sides, tapered rubber plugs on the ties will not be required. In these areas snap ties will be sufficient.

E. Form Coatings:

1. Provide commercial formulation compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of

concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water of curing compounds.

PART 3 - EXECUTION

3.01 GENERAL

A. Conform to ACI 347 "Recommended Practice for Concrete Formwork", Chapter 3, Construction. Control joint spacing shall match masonry control joints.

B. Allowable Tolerances: Construct formwork to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 347 "Recommended Practice for Concrete Formwork", and as follows:

1. Variation from plumb in lines and surfaces; 1/4" per 10 ft., but not more than 1".
2. Variation from level or from grades indicated on the drawings; for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, 1/4" in any bay or 20 ft. max. and 1/2" in 40 ft. or more.
3. Variation in cross-sectional dimensions of thickness of slabs and walls, minus 1/4" and plus 1/2".
4. Variations in footings plan dimensions, minus 1/2" and plus 2"; misplacement or eccentricity, 2% of the footing width in direction of misplacement but not more than 2"; thickness reduction minus 5%.

C. Provide for openings, offsets, key-ways, screeds, bulkhead, and other features required.

D. Before concrete placement check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.

E. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

F. Embedded Items:

1. Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.
2. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.
3. Provide metal inserts for anchorage of materials or equipment to concrete construction, not supplied by other trades and as required for the work.
4. Slip resistant nosings shall be cast into concrete.
   a. Provide Spectra® type 6063-T5 extruded aluminum safety nosings as manufactured by Wooster Products, Inc. for exterior stairs.
      i. Anti-slip filler shall contain not less than 60% virgin grain Aluminum Oxide abrasive.
      ii. Binder is to be fully-cured resilient type epoxy, with epoxy binder to filler ratio 13% minimum.
      iii. Epoxy/Abrasive filler shall extend over the curved front edge of nosing and shall be securely bonded to the aluminum base.
      iv. Contractor shall install per manufacturer's recommendations.

G. Coat form contact surfaces with form-coating compound before reinforcement is placed.

3.02 FORMWORK

A. Forms for exposed concrete:

1. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.

2. Use extra studs, walers and bracing as required to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form materials which will produce bow.

3. Form molding shapes, recesses and projections with smooth-finish materials, and install in forms with sealed joints to prevent displacement.

B. Corner treatment for all concrete:

1. Form chamfers with 3/4" x 3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edge joints.

2. Extend terminal edges to required limit and miter chamfer strips at changes in direction.

3.03 REMOVAL OF FORMWORK

A. Formwork not supporting concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50`F for 24-hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided that curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements may not be removed in less than 14 days, and not until concrete has attained design minimum 28 day compressive strength.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 30 00: Cast-In-Place Concrete

B. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.

C. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Conform to requirements of the Wisconsin Building Code, and:

1. American Concrete Institute, ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures".
2. American Concrete Institute, ACI 318-99 "Building Code Requirements for Reinforced Concrete".
3. American Welding Society, AWS D 1.4-81 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction".
4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00.

B. Shop Drawings:

1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.
2. Indicate bar schedules, stirrup spacing, and diagrams of bent bars.
3. Obtain acceptance of shop drawings before fabrication.

C. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT DELIVERY: STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent damage and accumulation of dirt or excessive rust.

C. Deliver and store welding electrodes in accord with AWS D 1.4.

1.06 REFERENCE STANDARDS

A. ACI 301 - Specification for Structural Concrete for Buildings.

B. AWS D.4 - Structural Welding Code - Reinforcing Steel.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Bars:

1. Deformed and Plain Billet-Steel bars for concrete reinforcements. ASTM 616, Grade 60, except that all bars shall be bend tested and shall meet the bend test requirements of axle steel reinforcing bars, Grade 60 ASTM A617.
2. Axle Steel deformed and plain bars for concrete reinforcement; ASTM A 617, Grade 60.

B. Wire:

1. Steel wire, plain, for concrete reinforcement: ASTM A 82.
2. Steel wire, deformed for concrete reinforcement: ASTM A 496.

C. Wire Fabric:

1. Steel welded wire, fabric, plain for concrete reinforcement: ASTM A 185.
2. Welded deformed steel wire fabric for concrete reinforcement: ASTM A 497.
3. Provide sheet wire fabric for concrete reinforcement. Rolled wire fabric is not permitted.

D. Tie Wire: Annealed steel, black, 16 gauge minimum.

E. Welding Electrodes: AWS A 5.1, low hydrogen, E70 series.

F. Fiber Mesh: Novomesh 950 as manufactured by SI Concrete Systems.

G. Supports for reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place.

1. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.
2. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
3. For footings, use chairs for reinforcing. (Do not float bars into place).

2.02 FABRICATION

A. Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice". In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.

B. Reinforcement with any of the following defects will not be permitted in the work.

1. Bar lengths, depths and bends exceeding specified fabrication tolerance.
2. Bend or kinks not indicated on drawings or final shop drawings.
3. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Placement:
   1. Comply with the Chapter 5-6 ACI 301.

B. Steel Adjustment:
   1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
   2. Do not move bars beyond allowable tolerances without concurrence of Architect/Engineer.
   3. Do not heat, bend, or cut bars without concurrence of Architect/Engineer.

C. Splices:
   1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
   2. Welding: Perform in accordance with AWS D 1.4.
   3. Do not splice bars except at locations shown on drawings without concurrence of Architect/Engineer.

D. Wire Fabric:
   1. Install in longest practicable length.
   2. Lap adjoining pieces one full mesh minimum and lay splices with 16 gauge wire.
   3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
   4. Offset end laps in adjacent widths to prevent continuous laps.
   5. Provide chairs and bolsters to properly locate fabric.

E. Fiber Mesh:
   1. Novomesh 950 shall be applied at an application rate of 5.0 lbs per cubic yard of concrete.

F. Bar & Fabric Supports:
   1. Provide sufficient numbers of supports and of strength to carry bar & fabric reinforcement.
   2. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support.
   3. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

G. Protect reinforcing with minimum thickness of concrete cover for cast-in-place concrete as follows; unless otherwise noted on the Drawings.
   1. Cast against and permanently exposed to earth: ..... 3"
   2. Exposed to earth or weather:
      a. #6 through #18 bars ..... 2"
      b. #5 bars, 5/8" wire and smaller ..... 1-1/2"
   3. Not exposed to weather or in contact with the ground:
      a. Slabs, walls:
         i. #14 and #18 bars ..... 1-1/2"
         ii. #11 and smaller ..... 3/4"

b. Beams, girders, columns:

i. Principle reinforcement, ties, stirrups, spirals ..... 1-1/2"

H. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.

I. Installation:

1. Position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, and bolsters, spacers and hangers, as required.
2. Arrange, space and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that ends are directed away from exposed concrete surfaces.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00: Submittal Procedures

B. Section 03 10 00: Concrete Forms and Accessories

C. Section 03 20 00: Concrete Reinforcement

D. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.

E. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability of successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Perform work in accordance with State of Wisconsin Building Code and:

1. American Concrete Institute, ACI 301 "Specifications for Structural Concrete for Buildings".
2. American Concrete Institute, ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete".
3. Where provisions of the above codes and standards are in conflict with the building code in force for this project, the most stringent shall govern.
4. ASTM-C309: Specification for Liquid Membrane Forming Compounds for Curing Concrete.

B. Allowable Tolerances: Flatwork true to plane 1/8" in 10'-0" in areas to receive vinyl composition tile or rubber flooring and flatwork true to plane 1/4" in 10'0" elsewhere.*

C. Tests:

1. As listed in "Methods of Sampling and Testing", ASTM C 94.
2. The Owner will engage an independent testing laboratory to perform compression tests, and will pay all costs of tests and transportation of test material.
3. Owner will submit 7 day and 28 day compressive strength test results to the Architect for his review.
4. Testing in accordance with Section 01 45 29.

D. Structural Design Data

1. Concrete:
   a. Footings: Type 1
   b. Exterior Pavement Aprons, Utility Encasements, Yard Slabs, Walks: Type 2
   c. Piers, Foundation Walls and Pole Bases: Type 3
   d. Floor Slabs, Topping for Precast Concrete Planks: Type 4
2. Concrete Mixes:

TYPE	MIN. COMP. STRENGTH (PSI/28 DAYS)	MAX. AGG. SIZE (IN.)	MIN. CEMENT SACKS/CU.YD.
1	3000	1 1/2	5.25
2	4000	3/4	6.25
3	4000	3/4	5.75
4	4000	3/4	6.00

TYPE	MAX. WTR/ CEMENT RATIO	MAX. SLUMP (INC.)	AIR CONTENT (PERCENTAGE)
1	.50	3	--
2	.45	3	6*
3	.45	3	--
4	.48	3	--
*Exterior concrete exposed to frost. Minimum air content 6% plus or minus 1 percent.			

1.04 SUBMITTALS

A. Certificates:
   1. Manufacturer's certification that materials meet specification requirements.
   2. Material content per cubic yard of each class of concrete furnished.
      a. Dry weights of cement.
      b. Saturated surface-dried weights of fine and coarse aggregate.
      c. Quantities, type and name of admixtures.
      d. Weight of water.
   3. Ready-mix delivery tickets, ASTM C 94.

B. Concrete mix design for each class of concrete to be used.

C. Manufacturer's literature regarding curing compounds, hardeners, fillers and Waterstops.

D. Independent testing agency report on slab tolerances.

E. LEED Submittals:
   1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
      a. Indicate quantity each of post-industrial or post-consumer recycled content.
      b. Include statement indicating costs for each product having recycled content.
   2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT DELIVERY: STORAGE AND HANDLING

A. Cement: Store in weather-tight enclosures and protect against dampness, contamination, and warehouse set.

B. Aggregates:
   1. Stock pile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates.
   2. Use only one supply source for each aggregate stock pile.

C. Admixtures:
   1. Store to prevent contamination, evaporation or damage.
   2. Protect liquid admixtures from freezing or harmful temperature ranges.
   3. Agitate emulsions prior to use.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Allowable Concrete Temperatures:
   1. Cold weather: Maximum and minimum, ASTM C 94-86b.
   2. Hot weather: Maximum 90`F.

B. Do not place concrete during rain, sleet or snow unless protection is provided.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Concrete: Ready-mixed Concrete, ASTM C 94-86b.
   1. Cement:
      a. Cement Type 1, ASTM C 150-86 unless otherwise noted.*
      b. Air entraining gray cement shall be used in concrete mix designs for exterior flatwork to receive exposed aggregate finish.
   2. Admixtures:
      a. Air entraining: ASTM C 260-86.
      b. Chemical: Type A, ASTM C 494-86.
      c. Do not use calcium chloride in concrete.
   3. Coarse Aggregate: ASTM C 33-86.
   4. Slump: Plus tolerance 0, minus tolerance 1-1/2".
   5. Mix proportioning: To produce 7 day & 28 day compressive strength of moist cured laboratory samples, as specified under Structural Design Data.

B. Gyp-Crete or equal.

C. Flyash:
   1. Flyash must be tested to ensure it meets ASTM, it's quality is consistent, and its form the same source. Flyash shall be type C with a low sulfur content.
   2. Proportioning by weight of cement shall be as follows:
      a. For vertical formed surfaces not requiring a troweled surface, the proportions shall be adjusted as follows for every 100 lbs of mix:
         i. 20 – 30 lbs. flyash
         ii. 80 – 70 lbs. cement respectively
      b. For horizontal formed surfaces requiring a troweled surface, the proportions shall be adjusted as follows for every 100 lbs of mix:
         i. 10 – 15 lbs. flyash
         ii. 90 – 85 lbs. cement respectively
   3. Use of flyash in exterior concrete on or after October 1 is not permitted.

2.02 EVAPORATION REDUCER

A. CONFILM as manufactured by Masterbuilders Technologies. Install per manufacturer's

recommendations.

2.03 CONCRETE CURING AND SEALING COMPOUND

A. Interior concrete flatwork to receive finish flooring: VOCOMP-20 Acrylic Sealing Compound by W.R. Meadows.

2.04 CONCRETE FLOOR JOINT SEALANT

A. Joint fillers shall include construction joints, control joints, expansion joints, building isolation joints, bollard isolation joints, and isolation joints around floor cleanouts. Joint compounds shall be as follows:

1. Interior Concrete flatwork to remain exposed:

a. All joints in concrete flatwork to receive floor finish in accordance with Division 9 will receive joint filler under Division 9.

PART 3 - EXECUTION

3.01 INSPECTION

A. Assure that excavations and form work are completed, and that ice and excess water are removed.

B. Check that reinforcement is secured in place.

C. Verify that expansion and isolation joint material, anchors and other embedded items are secured in position.

3.02 INSTALLATION

A. Preparation:

1. Notify other crafts involved in ample time to permit the installation of their work; cooperate with other trades in setting such work, as required.
2. Thoroughly wet wood form immediately before placing concrete, where form coatings are not used.
3. Coordinate the installation of joint materials and bond breakers with placement of forms and reinforcing steel.
4. Provide mechanical equipment for conveying concrete, and runways for wheeled concrete conveying equipment as required.

B. Placing Concrete:

1. Place concrete in compliance with the practices and recommendations of ACI 304.
2. Convey concrete from mixer to final position by method which will prevent separation or loss of material.
3. Maximum amount of concrete free fall 4 feet so that placement so concrete remains plastic and flows into position.
4. Deposit concrete in continuous operation until panel or section is completed.
5. Place concrete in horizontal layers 18" maximum thickness.
6. Use air-entrained admixture 6% plus or minus 1% in exterior concrete exposed to weather.
7. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is complete. Checkerboard placement is not permitted. Concrete shall be placed in strips.

C. Finishing

1. Tops of forms:
   a. Strike concrete smooth at tops of forms.
   b. Float to texture comparable to formed surfaces.
2. Formed surfaces:

a. As-cast finish.
b. Patch tie holes and defects after form removal with compatible concrete grout.
c. Remove fins from surfaces.

3. Flatwork:
   a. General
      i. Strike and level concrete.
      ii. Do not work surface until ready for floating.
      iii. Power float surface on disappearance of water sheen.
      iv. Hand float areas inaccessible to power float.
   b. Troweled finish:
      i. Power trowel all floor surfaces to smooth finish, unless otherwise noted below.
      ii. Hand trowel areas inaccessible to power trowel.
   c. Site Concrete:
      i. Broom or belt finish: Draw broom or burlap belt across concrete surface after troweling.
   d. Hardening:
      i. Harden concrete in accordance with manufacturers recommendations.
   e. Curing and Sealing:
      i. Keep concrete moist by using curing compounds in accordance with manufacturers recommendations and moisture cure in accordance with ACI 301-84.
   f. Place concrete joint fillers, and waterstops as specified herein and in accordance with manufacturer's recommendations.
   g. Tolerances:
      i. Overall values of F_F = 35 (flatness) and F_L = 25 (levelness); with minimum local values of F_F = 24 (flatness) and F_L = 15 (levelness) for slabs-on grade.
      ii. Contractor shall retain the services of an independent testing firm to measure and document floor tolerances. A written report of the findings shall be submitted to the Architect within 2 weeks after slab placement.

D. Testing:
   1. All concrete shall be tested in standard 6 x 12 inch cylinders.

3.03 PROTECTION OF COMPLETED WORK

A. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock and vibration.

3.04 CLEANING

A. All cleaning shall comply with Technical Specification Section 01 71 00 Site Conditions of this Project Manual.

END OF SECTION

SECTION 03 39 23
MEMBRANE CONCRETE CURING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Application of clear, acrylic, slip resistant curing and sealing compound.

1.02 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCES

A. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

B. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

C. AASHTO M 148 - Liquid Membrane Forming Compounds for Curing Concrete.

D. United States Department of Agriculture.

1.04 1.04 SUBMITTALS

A. Comply with Section 01330 - Submittal Procedures.

B. Submit manufacturer's product data and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area in accordance with manufacturer's instructions.

C. Keep away from sparks and flames.

D. Avoid direct contact with this product as it may cause irritation of the eyes and/or skin.

E. Protect materials during handling and application to prevent damage or contamination.

F. Do not dilute curing and sealing compound.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Apply curing and sealing compound in exterior applications only.

B. Do not apply curing and sealing compound if the temperature of the concrete is below 40°F (4°C).

C. Avoid application in direct sunlight combined with high temperatures.

D. Do not apply to concrete exposed to excessive moisture.

E. Do not use on dense or non-porous surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. W. R. MEADOWS, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Web Site www.wrmeadows.com.

2.02 MATERIALS

A. Performance Based Specification: Acrylic curing and sealing compound shall be a non-yellowing, clear, slip resistant, acrylic curing and sealing compound meeting the following requirements:
   1. ASTM C309, Type 1, Class A and B.
   2. AASHTO M 148, Type 1, Class B.
   3. ASTM C1315 Ultraviolet Resistance – Class A - Non-yellowing
      a. Chalk Resistance – No chalking
      b. Check/Peel Resistance – No deterioration
   4. Dried film accepted by USDA.
   5. Meets the maximum VOC content limits of 700 g/L for Concrete Curing and Sealing Compounds as required by the U.S. EPA Architectural Coatings Rule.

B. DECK-O-GRIP Non-Yellowing, Slip-Resistant, Acrylic Curing and Sealing Compound by W. R. MEADOWS.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive curing and sealing compound. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive curing and sealing compound.

B. Clean and prepare surfaces to receive curing and sealing compound in accordance with manufacturer's instructions ensuring that all stains, oil, grease, form release agents, dust and dirt removed prior to application.

C. Ensure surface is clean and free from all powdered release agent residue.

D. Apply curing and sealing compound when surface water has completed disappeared on new concrete.

E. Ensure concrete surface will not be marred by walking workmen.

3.03 APPLICATION

A. Follow manufacturer's recommendation application instructions for existing concrete.

B. Apply curing and sealing compound in accordance with manufacturer's instructions.

C. Mix curing and sealing compound thoroughly.

D. Apply a uniform film using a standard industrial-grade sprayer, equipped with a neoprene hose and gaskets, as well as a 9505-E spray tip at a rate of 600 square feet per gallon. Alternatively, apply using a short nap roller.

E. Apply a second coat at right angles to the first at a rate of 600 square feet per gallon.

F. Stir occasionally during application to ensure particles remain suspended.

3.04 PROTECTION

A. Restrict foot traffic for at least 4 hours, 12 hours is preferable.

END OF SECTION

SECTION 04 05 13
MASONRY MORTAR

PART 1 - GENERAL

1.01 SCOPE

A. Perform all work required to complete the mortar indicated by the Contract Documents, and furnish all items necessary for it's proper installation.

1.02 RELATED SECTIONS

A. Application of mortar used in the installation of masonry units is specified in each respective section of Masonry Materials and is not included in the work required for this section.

1.03 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.04 REFERENCE

A. American Society for Testing and Materials (ASTM).

1. ASTM C144, Specification for Aggregate for Masonry Mortar
2. ASTM C150, Specification for Portland Cement
3. ASTM C207, Specification for Hydrated lime for masonry purposes.
4. ASTM C270, Specification for Mortar for Unit Masonry
5. ASTM C404, Specification for Aggregates for Masonry Grout.
6. ASTM C476, Specification for Grout for Masonry.

1.05 SUBMITTALS

A. Submit product data on all mortars, colors, and admixtures.

B. Submit certification that mortar and grout material meet ASTM standards.

C. Submit certification that mortar and grout material contain specified water repellant Admixture.

D. Submit water repellant admixture manufacturer's literature.

1.06 SUBMITTALS

A. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.07 PRODUCT HANDLING

A. Deliver and store in manufacturers original containers.

B. Store above ground on skids, and protect from the elements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site dry and in unbroken containers. Store materials above ground in waterproof shelters.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Silo-mixed (non-colored) Blend: As manufactured by Dri-Mix Concrete Co., Glen-Gery Corp., Medusa Cement Co., Tamms Industries Co., Twin City Concrete Products Co., The Western Lime and Cement Co. Equivalent products of other manufactures may be acceptable if approved equal.

2.02 MATERIALS

A. Silo-Mixed Blend: Portland Cement/Lime pre-mixed mortar complying with this specification. Masonry cement pre-mixed mortar is not acceptable.

1. Portland Cement: ASTM C150, Type 1, Portland Cement
2. Lime: ASTM C207, Type S, Hydrated Lime

B. Fine Aggregate: ASTM C144

C. Coarse Aggregate: ASTM C404, Size No. 8

D. Water: Clean and potable

E. Mortar Admixture: High strength, high bond, weather resistant, abrasion resistant additive to mortar, when directed or indicated on the Drawings, "Laticrete 8510" as manufactured by Laticrete International, Inc., or approved equal. DRY-BLOCK Integral Water Repellant for Mortar as manufactured by W.R. Grace & Co., Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA 02140. MORTAR TITE, Integral Admixture for Water Repellant Mortar, as manufactured by Addiment, Inc.

F. Site mix of mortar is not permitted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's published instructions and requirements. Install materials with uniform appearance and in proper relation with adjacent construction.

B. See specific section of Masonry Materials for Installation instructions.

3.02 PROPORTIONS AND MIXING

A. Meet requirements of ASTM C270 and proportion mortar types as specified.

B. Proportion material accurately and mix thoroughly by silo machine to a uniform consistency and color. Mix mortars with the maximum amount of water consistent with workability.

C. For facing work, add Mortar color, as selected when indicated on the drawings and white cement to product mortar as established by sample.

D. When additional bonding is required between mortar and masonry so as to produce a high strength, high bond, weather resistant or abrasion resistant joint, add an admixture to mortar. Use admixture in conditions of sill rowlocks, top of wall, or exposed scope area surfaces; anywhere water might collect and set atop masonry work. Admixture powder shall be thoroughly mixed with dry mortar and aggregate before adding the gauging water.

E. Do not use mortar that has begun to set. Re-temper mortar by adding water if mortar begins to stiffen from evaporation or absorption of a part of the mixing water. Use and place mortar in final position with 2-1/2 hours after mixing.

3.03 MORTAR SCHEDULE

A. Interior Masonry Partitions
   1. Mortar, Type N, ASTM C 270, 750 PSI minimum, cement-lime
   2. Proportions: Portland Cement - one part; Lime - 1/2 to 1-1/4 parts; and Aggregate - 2-1/4 to 3 parts

B. Interior Reinforced Load Bearing Masonry Partitions.
   1. Mortar: Type M, ASTM C 270, 2500 PSI minimum, cement-lime.
   2. Proportions: Portland Cement - one part; Lime - 1/4 part; and Aggregate - 2-1/4 to 3 parts

END OF SECTION

SECTION 04 05 23
MASONRY ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Described Elsewhere:
   1. Division 4 Section – Mortar
   2. Division 4 Section – Concrete Masonry Units

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:
   1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
   2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
   3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. AA Wire Products Co.
   2. Dur-0-Wall Products
   3. National Wire Products
   4. Ty-Wall Products

B. Codes and Standards:
   1. All work shall conform to the requirements of the State of Wisconsin Building Code.
      a. All work shall conform to the requirements of the following codes and standards:
      b. American Society for Testing and Materials (ASTM) Specifications as referenced in this section.
      c. Where provisions of pertinent regulations, codes, and standards conflict with this specification, the more stringent provisions shall govern.

1.04 PRODUCT HANDLING

A. Deliver and store in manufacturers original containers.

B. Store above ground on skids, and protect from the elements.

1.05 SUBMITTALS

A. LEED Submittals:
   1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
      a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Wire ASTM A 82-76

B. Steel Sheet ASTM A 366-72 or ASTM A 569-72

C. Galvanized Finish ASTM A 153-73, Grade B-1 or B-2

D. Neoprene ASTM D 2000 2AA-805, 80 Durometer

E. PVC ASTM D2287 Type PVC 6534-4, 80 Durometer

2.02 ANCHORING DEVICES

A. Wire: 3/16" Diameter Minimum - Hot Dip Galvanized

B. Sheet: 16 gage minimum

C. Galvanized Finish

2.03 MASONRY FLASHING SYSTEMS

A. Masonry Flashing and Termination Bar:

1. Masonry Flashing:
   a. Model No. MFL- Metal Flashing as manufactured by Hohman & Barnard set in a bed of sealant.
   b. Material: Type 304 Stainless Steel
   c. Profiles: As shown on the drawings.
2. Termination Bar:
   a. Model No. #T1 as manufactured by Hohman & Barnard
   b. Material: Type 304 Stainless Steel
   c. Profile: 1/8" x 1"
   d. ¼" holes spaced 16" o.c.

2.04 CONTROL JOINTS

A. Pre-molded neoprene or PVC type

2.05 BOND BREAKER STRIP

A. 15 lb. asphalt felt

2.06 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and subject to approval of the Architect.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Control and Expansion Joints:

1. Provide vertical expansion, control and isolation joints in masonry where shown.
2. Rake out mortar in preparation for application of caulking and sealants.

B. Anchoring Devices:
   1. Build in required anchoring and related items as the masonry work progresses.

C. Bond Breaker Strip:
   1. Install bond breaker strip as shown on drawings.

D. Masonry Vents and Nets
   1. Keep masonry vents and nets free of mortar droppings.
   2. Install in masonry head joints.
   3. Install perpendicular and parallel to the plane of the masonry unit and wall.

END OF SECTION

SECTION 04 22 00
CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Described Elsewhere:
   1. Section 04 05 13: Masonry Mortar
   2. Section 04 05 23: Masonry Accessories

1.02 MATERIAL INSTALLED BUT FURNISHED BY OTHERS

A. Hollow metal door and frames to be installed in concrete masonry walls
B. Bolts
C. Anchors
D. Nailing Blocks
E. Inserts
F. Steel Lintels
G. Louvers
H. Flashing

1.03 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:
   1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
   2. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.04 QUALITY ASSURANCE

A. Codes And Standards:
   1. All work shall conform to the requirements of the State of Wisconsin Building Code.
   2. All work shall conform to the requirements of the following codes and standards:
      a. American Society for Testing and Materials (ASTM) specifications as referenced in this section.
   3. Where provisions of pertinent regulations, codes, and standards conflict with this specification, the more stringent shall govern.
   4. ACI 530 "Building Code Requirements for Masonry Structures."
   5. ACI 530.1 "Specification for Masonry Structures."
   6. Minimum Compressive Strength of Concrete Masonry: f'm=1350psi.

1.05 PRODUCT HANDLING

A. Protection:
   1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacement:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the owner.

C. Storage:
1. Store masonry units aboveground on level platforms which allow air circulation under stacked units.
2. Cover and protect against wetting prior to use.
3. Reinforcing, and anchors shall be protected from contact with soil.

1.06 SUBMITTALS

A. Certification from the manufacturer that the masonry is fabricated with specified water repellant additives.

B. Submit manufacturer's literature of water repellant admixture to be used in masonry.

C. Certification from Manufacturer that masonry units meet the required material specification and have been sampled and tested in accordance with ASTM C140.

D. LEED Submittals:
1. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

PART 2 - PRODUCTS

2.01 GENERAL

A. Fire Resistance Ratings:
1. Masonry units used in fire rated assemblies must be manufactured to endure the fire test made in conformance with ASTM E 119-76 "Standard Methods of Fire Tests of Building Construction and Materials". A concrete masonry units to be constructed in

2.02 HOLLOW LOAD BEARING UNITS

A. ASTM C 90-75, Type I.

B. Compressive strength of average of 3 units
1. Type M or S mortar: 1900 psi
2. Type N Mortar: 2150 psi

C. Nominal face dimensions: 8" x 16".

2.03 SOLID LOAD BEARING UNITS

A. ASTM C145-75, Type 1.

B. Grade:
1. Grade N: Exterior use above grade.
2. Grade S: Interior use above grade.

C. Nominal face dimensions: 8" x 16".

2.04 CONCRETE BUILDING BRICK

A. ASTM C 55-75, Type I.

B. Grade:
1. Grade N: Exterior use above or below grade.
2. Grade S: Interior use above grade.

C. Nominal face dimensions: 8" x 16".

D. Provide stretchers, corners, caps, cap ends, bullnoses and bond beams as required for a

complete and proper installation.

2.05 AGGREGATE

A. Provide lightweight aggregate on all exposed surfaces above grade excluding fire rated block.

2.06 WATER REPELLANT ADMIXTURE

A. Water repellant admixture shall be fabricated within the masonry.

B. Acceptable Products and Manufacturers:

1. DRY-BLOCK Integral Water-Repellant Admixture for Block as manufactured by W.R. Grace Company - Conn. Grace Construction Products or BLOCK PLUS W or W-10 as manufactured by Addiment, Inc.

C. Technical Data:

1. Achieves Class E, ASTM E154 wind-driven rain resistance test (5"/hr. rain and 62.5 mph wind). Increase in flexural bond strength (ASTM E72). Exceed standard units according to ASTM C140 for both normal and lightweight units. Water vapor transmission reduced when tested in conformity with ASTM E96. ASTM 514 for wind-driven rain resistance, ASTM E 72-74 for bond strength to mortar and ASTM E 96 for reducing water vapor transmission.

PART 3 - EXECUTION

3.01 GENERAL

A. Materials:

1. Concrete masonry units shall be dry when laid.
2. Reinforcement to be placed shall be free of loose rust, ice, soil, or other detrimental coatings.
3. All masonry units exposed to view, top blocks, end blocks, corner blocks, sills, jambs and headers shall be constructed of units 100% solid. No masonry units exposed to view shall display interior or end cores.

B. Cutting:

1. All masonry cutting shall be done with motor driven masonry saws.

C. Protection:

1. When rain or snow is imminent and work is discontinued, the tops of exposed masonry walls shall be covered with a well secured, non-staining, waterproof cover.
2. Adequate precautions shall be taken to prevent damage to the walls during erection by high winds or other causes.
3. Where necessary, foundation walls shall be temporarily braced to prevent damage from backfilling operations.

D. Pattern:

1. Lay all masonry in running bond unless otherwise noted.

E. Joining Masonry:

1. Stop off horizontal runs of masonry by racking back 1/2 length of unit in each course.
2. Toothing is not permitted except upon written acceptance of the Architect.
3. Joining fresh masonry to set masonry:
   a. Remove loose masonry and mortar
   b. Clean bonding surfaces before placing new work

F. Placing Masonry:

1. Adjust each unit to final position while mortar is still soft and plastic.

2. Mortar coverage:
    a. Hollow units:
        i. Hollow units shall be laid with full mortar coverage on horizontal and vertical face shells, except that webs shall also be bedded in all courses of piers, columns, and pilasters, and in the starting course on solid foundation walls, thicken floors, and where adjacent to cells or cavities to be reinforced and/or filled with grout or concrete.
    b. Solid units:
        i. Solid units shall be laid with full head and bed joints.
3. Any unit disturbed after mortar has stiffened shall be removed and re-laid with fresh mortar.
4. Vertical cells to be filled with grout shall be aligned to provide a continuous unobstructed opening.
5. Mortar joint thickness shall be a nominal 3/8" to provide overall modular unit dimensions.

G. Tooling and Tuckpointing:
1. Tooling:
    a. Tool exposed joints when "thumb-print" hard with a round jointer, slightly larger than width of joint.
    b. Trowel-point or concave-tool exterior joints below grade.
    c. Flush cut all joints not tooled.
    d. Mortar joints in surfaces to be purged or covered with other masonry or hard tile should be cut flush.
2. Tuck pointing:
    a. Rake mortar joints to a depth of not less than 1/2 in. no more than 3/4 in.
    b. Fill solidly with Type "S" pointing mortar.
    c. Tool joints.

H. Built-In Items:
1. Bolts, anchors, steel reinforcing, steel joint reinforcing, metal fabricated doorframes, lintels, and other accessories shall be installed as the masonry work progresses.
2. Chases shall be built-in and not cut-in.
3. Flashing:
    a. Clean surface of masonry smooth and free from projections which might puncture flashing material.
        i. Place through-wall flashing on bed of mortar, as seen in the Plans.
        ii. Cover flashing with mortar.
4. Sealant Recesses:
    a. Leave joints around outside perimeters of doors, window frames, and other wall openings:
        i. Depth: uniform 3/4 in.
        ii. Width: 1/4 in. to 3/8 in.
5. Movement Joints:
    a. Keep clean from all mortar and debris.
    b. Locate as shown on drawings.
6. Flashing:
    a. Keep clean from all mortar and debris.
    b. Locate as shown on drawings.
7. Hollow Metal Door & Window Frames:

a. Install as masonry wall construction progresses.

I. Tolerances:

1. Variation from the Plumb:

a. In the lines and surfaces of columns, walls and arises: in 10 feet - 1/4 inch; in any story or 20 feet maximum -3/8 inch, in 40 feet or more - 1/2 inch.

b. For external corners, control joints and other conspicuous lines: in any story or 20 feet maximum - 1/4 inch; in 40 feet or more - 1/2 inch.

2. Variation from the Level or the Grades Indicated on the Drawings.

3. Variation of the Linear Building Lines from Established Position in Plan and Related Portion of Columns, Walls and Partitions.

4. Variation in cross-sectional dimensions of Columns and in the Thickness of Walls: Minus 1/4 inch; plus 1/2 inch.

3.02 REINFORCEMENT

A. Reinforcement shall be factory-fabricated sections as defined in Specification Section 04 05 23 "Masonry Accessories."

B. Reinforcement shall be continuous except at control joints or expansion joints.

C. Reinforcement splices shall be lapped 6 inches or more.

3.03 BONDING AND ANCHORING

A. Corners:

1. Bond corners by lapping alternate courses of the corner walls.

B. Intersecting Walls:

1. Bond intersecting walls by laying 1/2 of the units in masonry bond or by providing horizontal rigid steel anchors 16" on center vertically.

C. Masonry Walls Adjoining Structural Steel:

1. Anchor masonry walls to structural steel by keying masonry to steel or by providing flexible metal anchors 16" on center vertically or 32 " horizontally as required.

3.04 CLEANING

A. Cut out any defective joints and holes in new exposed masonry and repoint with mortar.

B. All concrete masonry units, shall be cleaned with soap powder or other mild solutions, stiff brushes, and clear water. For new construction, this should not be attempted until 5 days after final masonry unit has been laid.

C. If stiff brushes, soap and water not suffice, the surface shall be wetted with clear water then scrubbed with a solution of Dedrich 202, Vanadrol, or Sure Kleen 600 in accordance with manufacturer's recommendations followed immediately by a thorough rinsing with clear water working from the top down. This shall not be attempted until seven days after the final masonry unit has been laid.

D. Protect all sash, metal lintels and other corrodible parts when masonry is cleaned with acid solution.

E. Leave work area and surrounding surfaces clean and free of mortar spots, drippings, and broken masonry.

F. All cleaning procedures and materials shall be approved in advance of commencement of work by the Owner's representative. Follow written instructions on cleaning procedures from American Masonry Institute.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 DESCRIPTION

A. The erection and installation of materials specified herein are required under this Contract.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 WORK FURNISHED BUT NOT INSTALLED

A. Anchor Bolts, Angles and Plates.

B. Loose lintels, shelf angles, and plate steel.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

1. All work shall conform to the requirements of the State of Wisconsin Enrolled Building Code.
2. All work shall conform to the requirements of the following codes and standards:
   a. American Institute of Steel Construction (AISC)
      i. "Load and Resistance Factor Design for Structural Steel Buildings" - 1993.
      ii. "Code of Standard Practice For Steel Buildings and Bridges" - 1992
      iii. "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A325 or A490 Bolts" - 1988
   b. American Society for Testing and Materials (ASTM), Specifications as referenced in this section.
   c. American Welding Society (AWS) D1.1 "Structural Welding Code".
3. Where provisions of pertinent codes and standards conflict with this specification, the more stringent provisions shall govern.

1.05 SUBMITTALS

A. Shop Drawings:

1. Within 15 days after award of Contract, and before any of the materials of this Section are delivered to the job site, submit complete shop drawings to the Architect in accordance with the provisions of Section 01 33 00 of these Specifications; show erection plans, connection details including location, type and size of all bolts and welds. Weld symbols shall conform to AWS A2.4-86 "Symbols for Welding and Nondestructive Testing."

B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type) including certified copies of mill reports covering chemical and physical properties.
2. High strength bolts (each type), including nuts and washers.
   a. Indicate Direct Tension Indicators if used.
3. Structural Steel Primer Paint.

C. Welder's Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

D. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
3. Credit IEQ 4.2: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.06 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacement:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

C. Delivery:

1. Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete, or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations, or masonry work.

D. Storage:

1. Structural steel shall be stored off the ground and kept free of dirt and other foreign matter.
2. Other materials shall be stored in a weather-tight and dry place until ready for use in the work.

E. Submittals

1. Submit in accordance with Section 01 33 00.
   a. Steel shop drawings.
   b. Grout data and instruction sheet.

c. Product Data.

d. Welder's Certificates.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel:

1. ASTM A36 "Steel Plates, Bars and Angles Only" Fy = 36ksi.
2. ASTM A572 - GR 50 "Structural Steel" Fy = 50ksi.
3. ASTM A53, Grade B "Welded and Seamless Steel Pipe".
4. ASTM A500 "Cold-Formed Welded and Seamless Carbon Steel Structural Tubing In Rounds And Shapes."
5. ASTM A501 "Hot-Formed Welded and Seamless Carbon Steel Structural Tubing."
6. ASTM A570, Grade D or E, "Hot Rolled Carbon Steel Sheets and Strip, Structural Quality"
7. Shear Stud Connectors: ASTM A309
8. Anchor Bolts and Threaded Rods: ASTM A36.

B. Fasteners:

1. Bolts:
   a. ASTM A325 "High Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hard Washers."
   b. ASTM A307 "Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners."

C. Preparation & Primer:

1. Surface Preparation: SSPC-SP3, Power Tooled Cleaned and Solvent Wiped
2. Primer: Zinc-rich urethane 2.5-4.0 dry mil shop. Color to be gray.

D. Grout:

1. Grout shall comply with Technical Specification Section 03 60 00.

2.02 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first quality of their respective kinds, and subject to approval of the Architect.

PART 3 - EXECUTION

3.01 TOLERANCES

A. Rolling, fabricating and erection tolerances shall conform to the requirements of AISC "Code of Standard Practice for Steel Buildings and Bridges", except for architecturally exposed steel which shall conform to the AISC "Specification for Architecturally Exposed Structural Steel."

3.02 FABRICATION

A. General:

1. Fabricate all structural steel in accordance with the State of Wisconsin Building Code and the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings and Code of Standard Practice for Steel Buildings and Bridges.

B. Shop Painting:

1. Shop paint all steelwork, except contact surfaces which are to be welded, high strength bolted with friction type connections or in contact with concrete.

3.03 ERECTION

A. General:

1. Erect all structural steel in accordance with the State of Wisconsin Building Code and the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings and Code of Standard Practice.

B. Surface Conditions:

1. Inspection:
   a. Prior to all work, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
   b. Verify that all structural steel may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.
2. Discrepancies:
   a. In the event of discrepancy, immediately notify the Architect/Engineer.
   b. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

C. Column Bases, And Bearing Plates:

1. Column bases and bearing plates for beams and similar structural members shall be aligned with anchor bolts and grouted with non-shrink grout in accordance with Technical Specification Section 03 60 00.

D. Gas Cutting:

1. Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect/Engineer.

E. Field Touch-Up Painting:

1. After the erection of structural steel, touch-up paint field bolt heads, nuts, field welds and abrasions in the shop paint coating with the same paint used for the shop painting.

F. Install and maintain temporary support and shoring.

END OF SECTION

SECTION 05 45 00
METAL SUPPORT ASSEMBLIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The scope of work includes, but is not necessarily limited to, the furnishing of necessary materials, labor, tools, equipment, accessories and testing to complete the following:

1. Cold rolled channel studs, stud joists, tracks, runners, bracing, bridging, and furring.
2. All required accessories as indicated herein, as shown on the Drawings, and as per manufacturer's recommendations.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section"01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 QUALITY ASSURANCE

A. Comply with the recommended specifications of the following:

1. American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members, Cold-Formed Steel Design Manual, latest edition.
2. American Society for Testing and Materials, ASTM A 653/A 653M: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, and ASTM C 645: Standard Specification for Nonstructural Steel Framing Members.
3. AWS (American Welding Society) Structural Welding Code (D1.1); Specification for Welding Sheet Steel in Structures (D1.3)

1.04 SUBMITTALS

A. Furnish the following items for approval prior to delivery of materials to the site:

1. Shop drawings: Show materials, shop coatings, steel thicknesses, details of fabrication, details of attachment to adjoining work, size, location, and spacing of fasteners for attaching framing to itself, details of attachment to the structure, accessories and their installation, and critical installation procedures.

2. Calculations: Engineering calculations or data shall be submitted verifying the framing assembly's ability to meet or exceed design requirements as required by local codes for Architect's and Owner's review.
3. Descriptive literature: Manufacturer's literature containing product and installation specifications and details.
4. Contractor shall submit calculations or data to verify that framing members are in accordance with ASTM C 645.

B. LEED Submittals:
1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
3. Credit IEQ 4.2: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 DELIVERY AND STORAGE

A. Handle material in a manner which prevents permanent distortion or loss of structural properties. Store material off ground. Keep dry and protected from weather.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Material shall be manufactured by Dale/Incor, Dietrich Metal Framing, National Gypsum Co., or USG Corp.

2.02 MATERIALS

A. All non-structural framing members and accessories shall be of the type, size and spacing as engineered by the manufacturer and shall be manufactured per ASTM C 645.

B. All light gauge steel (unless noted otherwise) shall be formed from steel that corresponds to the requirements of ASTM A 653/A 653M, Grade A, (Minimum yield strength of 33 KSI).

C. All non-load-bearing walls and ceiling joists shall be spaced at 16" center to center unless noted otherwise.

D. All non-load-bearing walls to receive ceramic tile shall be minimum 18 gauge studs, track, bridging, and accessories.

E. All toilet room stud walls receiving water closets shall be 18 gauge studs, track, bridging, and accessories.

F. Knee wall construction shall be minimum 14 gauge studs, track, bridging, and accessories.

G. All ceiling joists shall be minimum 18 gauge joists, track, bridging, and accessories.

H. All exterior non-load-bearing walls, unless noted otherwise, shall be minimum 18 gauge studs, track, bridging, and accessories.

I. All interior non-load-bearing walls, unless noted otherwise, shall be minimum 20 gauge studs, track, bridging, and accessories. Doors and windows in interior non-load-bearing walls shall have two full height studs on each side of opening.

J. Facing material shall not be substituted for bridging.

K. All studs shall have manufacturer's standard punching.

L. All anchors shall be provided in accordance with the Drawings, specified herein, and in accordance with manufacturer's recommendations.

M. Metal furring channels shall be roll-formed, hat shaped sections made of 20 gauge galvanized steel.

N. Two-inch deep deflection track required at top of non-bearing walls.

O. 2 ½" studs shall have a 2" wide throat to accept 2" rigid insulation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Significant temporary concentrated floor or roof loads, such as construction loads due to stacking of heavy building materials, should be avoided during construction unless adequate additional means for carrying these loads has been provided by the Contractor and accepted by the Architect.

B. Tracks shall be securely anchored to the supporting structure as shown on the Drawings. Butt weld or splice track at all butt joints.

C. Studs shall be plumbed, aligned and securely attached to the flanges or webs of both upper and lower tracks. Torch cutting of load bearing members is not permitted.

D. Studs shall not be spliced. Coordinate with other trades to provide necessary backing, blocking or clearance in walls for anchorage or positioning of their work.

E. Provide insulation equal to that specified elsewhere in all doubled jamb studs and doubled header members which will not be accessible to the insulation contractor.

F. Joists shall be located directly over bearing studs, or a load distribution member (continuous header) shall be provided at top track.

G. Provide single row of bridging in joist spaces.

H. Provide additional joists and blocking in canopy at mechanical penetrations.

I. End blocking shall be provided where joist ends are not otherwise restrained from rotation.

3.02 FASTENINGS AND ATTACHMENTS

A. Anchorage of the tracks to the structure shall be with methods designed for the specific application. Size, penetration, type, and spacing shall be as shown on the Drawings.

B. Welds shall conform to the requirements of AWS D1.1, AWS D1.3, and AISI Manual Section 4 - Connections. All welds shall be touched-up using zinc rich paint.

C. Screws shall have a protective coating equivalent to cadmium or zinc plating Type NS for use in exterior assemblies.

D. Wire tying of members is not permitted.

3.03 RESTORATION OF GALVANIZING

A. After fabrication and erection, restore surfaces damaged or destroyed by application of Z.R.C. Cold Galvanizing Compound or Welco Cold-Galv. Also restore weld surfaces. Products shall be used in strict compliance with recommendations of manufacturer.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.1 and IEQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 SUMMARY

A. This Section includes the following metal fabrications:

1. Rough hardware.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Handrails and Guardrails.
5. Shelf and relieving angles.
6. Miscellaneous framing and supports for the following:
   a. Applications where framing and supports are not specified in other Sections.
   b. Steel overhead door frames in masonry walls

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section – "Structural Steel" for structural steel framing system components.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show

anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

C. Samples representative of materials and finished products as may be requested by Architect/Engineer.

D. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
3. Credit IEQ 4.1 and IEQ 4.2: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.06 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Plates, Shapes, and Bars: ASTM A 36/ A 36M.

C. Rolled Steel Floor Plates: ASTM A 786/A 786M.

D. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500.
2. Hot-Formed Steel Tubing: ASTM A 501.

E. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/ A 47M malleable iron or ASTM A 27/ A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153/A 153M.

F. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.02 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563/ A 563M, and, where indicated, flat washers.

C. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).

D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.

F. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.03 GROUT

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Non-shrink, Nonmetallic Grouts:
   a. B-6 Construction Grout; Bonsal American, Inc.
   b. Diamond-Crete Grout; Concrete Service Materials Co.
   c. Sure-Grip High Performance Grout; Dayton Superior Specialty Chemical Corp.
   d. Euco N-S Grout; Euclid Chemical Co.
   e. Five Star Grout; Five Star Products, Inc.
   f. Vibropruf #11; Lambert Corp.
   g. Crystex; L & M Construction Chemicals, Inc.
   h. Masterflow 928 and 713; ChemRex-Degussa Building Systems.
   i. Sealtight 588 Grout; W. R. Meadows, Inc.
   j. Sonogrout 14; Sonneborn Building Products, ChemRex-Degussa Building Systems
   k. Kemset; ChemMasters.

2.04 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 PSI (20 MPa), unless higher strengths are indicated.

2.05 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Remove sharp or rough areas on exposed traffic surfaces.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

H. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

I. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

J. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE

A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.07 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.08 LOOSE STEEL LINTELS

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

2.09 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

a. Except as otherwise indicated, space anchors 24 inches (600 mm) on-center and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

C. Fabricate support for suspended toilet partitions as follows:

1. Beams: Continuous steel shapes of size required to limit deflection to L/360 between hangers.

2. Hangers: Steel rods spaced not more than 36 inches (900 mm) on-center. Thread rods to receive anchor and stop nuts. Fit hangers with wedge-shaped washers for full bearing on sloping flanges of support beam.

3. Braces and Angles: Steel angles of size required for rigid support of beam and for secure anchorage.

2.10 FINISHES

A. General:

1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

2. Finish metal fabrications after shop assembly.

B. Shop Finish

1. Surface Preparation:

a. SSPC-SP1: The Society for Protective Coatings "Surface Preparation Specification No. 1 – Solvent Cleaning", September 1, 2000 Edition and SSPC-SP2: "Surface Preparation Specification No. 6 – Commercial Blast Cleaning", September 1, 2000 Edition.

2. Primer:

a. Fast curing, universal modified alkyd, rust inhibiting shop coat with good resistance to normal atmospheric corrosion compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Primer shall comply with all federal standards for VOC, lead, and chromate levels. Color shall be gray.

b. Shop prime immediately after surface preparation, applying according to manufacturer's instructions to provide a dry film thickness of not less than 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surface.

3. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:

a. ASTM A 153/A 153M for galvanizing hardware.

b. ASTM A 123/A 123M for galvanizing both fabricated and unfabricated products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip

0.0299 inch (0.76 mm) thick or thicker.

C. Touch-Up Painting
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint and paint all exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
   2. Galvanizing Repair Paint: High-zinc-dust-content paint for galvanizing welds and repair-painting galvanized steel, with dry film containing not less than 90 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

D. Finish Painting
   1. Finish Painting shall be performed under Division 9 Section – Paints and Coatings.

EXECUTION

2.11 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

B. Center nosings on tread widths with noses flush with riser faces and tread surfaces.

C. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

2.12 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

2.13 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use non-shrink, metallic grout in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.

2.14 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all the rough carpentry as indicated on the Drawings and specified herein. Furnish and install blocks, nails, bolts, screws, framing anchors, other rough hardware as shown on the Drawings.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
3. Credit IEQ 4.1 and IEQ 4.4: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 QUALITY ASSURANCE

A. Lumber Grading Rules and Wood Species to be in conformance with Voluntary Product Standard PS 20-70.

B. Plywood Grading Rules:

1. Softwood Plywood - Construction and Industrial: Product Standard PS 1-74.

C. Grade Marks: Identify all lumber and plywood by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
   a. S-GRN: Unseasoned.
   b. S-Dry: Maximum 19% moisture content.
   c. MC-15 or KD: Maximum of 15% moisture content.
   d. Dense.
2. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
   a. Type, grade, class, and identification Index.
   b. Inspection and testing agency mark.

1.04 SUBMITTALS

A. LEED Submittals:

1. Credit MR 5: Documentation of manufacturing location and origins of materials for

products manufactured within 500 miles of the building site.

2. Credit IEQ 4.1 and IEQ 4.4: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 PRODUCT DELIVERY: STORAGE AND HANDLING

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

B. Store materials a minimum of 6" above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.

C. Do not store seasoned materials in wet or damp portions of building.

D. Protect sheet materials from corners breaking and damaging surfaces, while unloading.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber:
   1. Dimensions:
      a. Specified lumber dimensions are nominal.
      b. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and the rules writing agencies.
   2. Moisture content: 19% maximum at time of permanent closing in of building or structure, for lumber 2" or less nominal thickness.
   3. Surfacing: Surface four sides (S4S), unless specified otherwise.
   4. Framing lumber, any commercial softwood species:
      a. Light framing:
         i. General framing: Construction Grade No. 2 and better, S.P.F.
         ii. Plates, blocking, bracing, furring, and nailers: Construction Grade No. 2 and better, S.P.F.
      b. Roof wood nailers where in contact with Precast Concrete:
         i. Nailers: Construction Grade No. 2 and better, pressure treated for rot resistance.

B. Plywood:
   1. Structural II, C-C, exterior, exterior graded plywood.
   2. Meter Readers and Telephone Backboards: 3/4" thick, A-D, group 1, interior.
   3. Fire Resistant Treated

C. Preservative Treated Wood Products:
   1. Waterborne salt preservatives for painted, stained, or exposed natural wood product:
      a. AWPB LP-2 aboveground application.
      b. Lumber redried to maximum moisture content of 19% stamped "DRY".
      c. Wood Preservative: Ammonical copper arsenite, or 5% solution of pentachlorophenol

D. Rough Hardware (Use galvanized at exterior locations):
   1. Lag Bolts: Comply with Fed Spec FF-B-561.
   2. Machine Bolts: Comply with ASTM A307.
   3. Nails: Common or box wire.

PART 3 - EXECUTION

3.01 CONDITIONS OF SURFACE

A. Verify that surfaces to receive rough carpentry materials are prepared to exact grades and dimensions. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 DELIVERIES

A. Stockpile materials sufficiently in advance of need to assure their availability in a timely manner for this Work. Make as many trips to the site as are needed to deliver materials of this Section in a timely manner to ensure orderly progress of the Work.

3.03 INSTALLATION

A. Provide wood bucks, sleepers, nailers, plugs or wood bricks, shims and furring for finish work.

B. Provide back-up for heating, plumbing and electrical fixtures and accessories.

C. Provide grounds where necessary for the plumb, level or true attachment of other work where the ground is later concealed.

D. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

E. Pressure-Treated Wood Products:

1. Provide pressure-treated wood for all framing, blocking, furring, nailing strips in contact with concrete and in conjunction with exterior surfaces.
2. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

F. Fit carpentry work to other work; scribe and cope as required for accurate fit.

G. Produce joints which are tight, true, and well nailed, with members assembled in accordance with the Drawings.

H. Selection of Lumber Pieces:

1. Carefully select members.
2. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.
3. Cut out and discard defects which render a piece unable to serve its intended function.
4. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist bow, crook, mildew, fungus, or mold, as well as improper cutting and fitting.
5. Do not shim any framing component.

3.04 INSTALLATION OF PLYWOOD

A. Placement:

1. Place with face grain perpendicular to supports and continuously over at least two supports.
2. Center joints accurately over supports.

3.05 FASTENING

A. Nailing:

1. Use only common wire nails or spikes, except otherwise specifically noted on the Drawings.
2. Provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike.
3. Nail without splitting wood.
4. Prebore as required.
5. Remove split members and replace with members complying with the specified requirements.

B. Bolting:
   1. Drill holes 1/16" larger in diameter than the bolts being used.
   2. Drill straight and true from one side only.
   3. Do not bear bolt heads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.

C. Screws:
   1. Screw plywood sheathing to metal stud canopy framing.
   2. For lag screws and wood screws, prebore holes same diameter as root of threads, enlarging holes to shank diameter for length of shank.

END OF SECTION

SECTION 06 41 16
PLASTIC LAMINATE CASEWORK & COUNTERTOPS

1.01 GENERAL DESCRIPTION OF WORK

A. This Section of the Specifications and related Drawings describe requirements pertaining to general casework and related items. The extent of the casework is as shown on the Drawings, and as specified herein.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.1 and IEQ 4.4: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 WORK INCLUDED

A. Furnish and install all cabinets and casework including tops, ledges, shelving, and supporting structures, closures, miscellaneous items of equipment as specified or as shown on the Drawings, including delivery to the Project site, unpacking, setting in place, leveling and scribe to walls and floors as required. Furnish and install all filler panels, knee space panels where specified, and scribes required for a finished installation.

B. Provide cutouts for electrical receptacles, can dispensing, and sinks as specified or where shown on Drawings, unless otherwise noted.

C. Provide sealant at the conjunction of the backsplash and wall.

1.04 WORK NOT INCLUDED UNDER THIS SECTION

A. Furnishing, installing and connecting of plumbing service lines within casework and final plumbing connections.

B. Furnishing, installing and final connection of all sink traps and special plumbing fittings and piping of unusual nature to meet local codes even though not specifically called for in the Specifications or shown on the Drawings.

C. Furnishing, installing and connecting of electrical service lines within casework and final electrical connection.

1.05 SUBMITTALS

A. SHOP DRAWINGS

1. Shop drawings shall show layout and dimensions for reference by mechanical trades, product reference numbers, construction details, elevations, methods of assembly, location of accessories, and relationship of this work to other work.

B. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
3. Credit IEQ 4.1 and IEQ 4.4: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.06 FIELD MEASUREMENTS

A. Field measurements shall be taken to verify that the equipment will fit into the designated space. Entryways, corridors and door openings shall be verified to insure that the equipment be manufactured in a manner to permit it to be moved properly into place.

1.07 WARRANTY

A. Casework Contractor shall provide a written guarantee to replace or repair at no expense to the Owner, all materials of this Contract found to defective within one (1) year of acceptance, due to defective materials and/or workmanship.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturer: Pionite

B. Pattern: to be selected by architect during review of submittals

C. Color: to be selected by architect during review of submittals

1. All exposed exterior vertical surfaces shall be surfaced with a high-pressure plastic laminate meeting current N.E.M.A. standards for vertical grade and shall be as selected from manufacturer's standard wood grains and solid colors.
2. Interior surfaces shall be neutral in color and of a melamine laminate equal to Kortron by Willamette Engineered Wood Products, bonded to a 45-pound density particleboard. Cabinets without doors shall receive same color interior as exterior.
3. Substrate for laminated surfaces shall be high density industrial grade particleboard with a minimum density of 45 pounds per cubic foot and a moisture content between 9% maximum and 6% minimum, and shall meet or exceed Commercial Standard Specification No. CS-236-66 and American Society of Testing and Materials, ASTM D 1037: Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.

A. BASE CABINETS

1. Top rails shall be 3/4" in thickness consisting of melamine laminate on both sides of a particleboard substrate. Exposed edges shall be plastic laminate edged in exterior matching finish.
2. Bottoms shall be 3/4" in thickness consisting of melamine laminate on both sides of a particleboard substrate. Exposed edges shall be plastic laminate edge in exterior matching finish.

3. Intermediate panels and rails where required shall be 3/4" thickness consisting of melamine laminate on both sides of a particleboard substrate. Exposed edges shall be melamine laminate edged in matching finish.
4. End Panels:
   a. Exposed ends shall be 3/4" in thickness, consisting of high pressure laminate of a selected color on one side and high pressure laminate of a neutral color on opposite side of a particleboard substrate. Exposed edges shall be plastic laminate edged in exterior matching finish.
   b. Concealed ends shall be 3/4" in thickness, consisting of melamine laminate, neutral in color, on both sides of a particleboard substrate. Exposed edges shall be melamine edged in matching finish.
5. Top rails, bottoms, intermediate rails and/or panels shall be joined to the cabinet panel ends by means of a permanent heavy duty locking mechanical fastener. This fastener shall be concealed at all joints of cabinet resulting in a clean, tight joint the full depth of cabinet.
6. The backs shall be 3/16" thick, faced on exposed side with a neutral color melamine laminate, and on reverse side with a backer sheet, and shall be let into cabinet end panels and further secured by means of self-expanding staples into the cabinet top, bottom and intermediate panel. Backs shall be recessed 3/8" to permit accurate scribe to wall.
7. Drawer body sides, bottoms back and front shall be 3/4" in thickness of 45-lb. density particleboard. Sides shall be tongued and grooved and further secured with glue and expanding staples into the drawer body front. Drawer backs shall be tongued, grooved, glued and pneumatically stapled to the sides. Drawer bodies shall be secured to plastic laminated drawer fronts.
8. Doors and drawer fronts shall be 3/4" in thickness consisting of high pressure laminate, of color selected, on exposed side, and high pressure laminate, neutral in color, on opposite side of a particleboard substrate. Edges shall be plastic laminate faced in exterior matching finish.
9. Shelves shall be 3/4" in thickness consisting of melamine laminate on both sides of a particleboard substrate. Front edges shall be melamine laminate faced to match shelves. Shelves shall be adjustable as shown on Drawings.
10. Removable backs where specified shall be retained in vertical cleats secured to the cabinet panel ends to provide tight joints yet be conveniently removable for access to plumbing and electrical.

B. WALL CABINETS

1. Tops shall be 3/4" in thickness consisting of melamine laminate on both sides of a particleboard substrate. Exposed edges shall be melamine laminate faced in matching finish.
2. Bottoms shall be 3/4" in thickness consisting of melamine laminate on both sides of a particleboard substrate. Exposed edges shall be melamine laminate faced in matching finish.
3. End Panels:
   a. Exposed ends shall be 3/4" in thickness, consisting of high pressure laminate, of color selected, on one side and high pressure laminate, neutral in color, on opposite side of a particleboard substrate. Exposed edges shall be plastic laminate faced.
   b. Concealed ends shall be 3/4" in thickness consisting of melamine laminate, neutral in color, on both sides of a particleboard substrate. Exposed edges shall be melamine laminate faced.
4. Tops and bottoms shall be joined to the cabinet panel ends by means of a permanent heavy duty locking mechanical fastener. The fastener shall be concealed at all points of cabinet resulting in a clean tight joint the full depth of cabinet.

5. Backs of wall cabinets shall be 3/16" thick, faced on exposed side with a neutral color melamine laminate and on reverse side with a backer sheet, and shall be let into cabinet end panels and further secured by means of self-expanding staples into the cabinet top and bottom. Backs shall be recessed 3/8" to permit accurate scribe to wall and in addition, shall incorporate a filler support in recess at top and bottom to insure permanent installation of wall-hung cabinets.
6. Doors shall be 3/4" in thickness consisting of high pressure laminate, of color selected, on exposed side, and high pressure laminate, neutral in color, on opposite side of particleboard substrate. Edges shall be plastic laminate faced to match exterior.
7. Shelves shall be 3/4" in thickness consisting of melamine laminate, neutral in color, on both sides of a particleboard substrate. Front edges shall be melamine finish to match shelves. Shelves shall be as shown on Drawings.

C. HARDWARE

1. Hinges for all wall cabinets, base cabinets and case doors shall be of the "C" fully concealed, self-closing European hinge with 180 degree opening angle. Grass Hinge, 393-VZ8 or equal. Offset kitchen cabinet type, plain butt hinges or hinges with removable pins will not be acceptable. All hinge screws shall be concealed when door is closed. Doors under 44" high shall have two hinges and those over 44" high shall have three hinges. Hinges on all base cabinets shall be through-bolted.
2. Pulls as standard shall be surface mounted, modern design, heavy duty institutional type in brushed chrome finish.
3. Locks for drawers and hinged doors, where specified, shall be heavy duty, cylinder type, with five disc tumblers and shall be keyed and master-keyed as specified.
4. Drawer slides for all standard type drawers shall be equal to Accuride 4017 full extension slide, side mount with positive stop and load capacity up to 100 lbs. Roll-out shelves shall have slides equal to Accuride 3832, side mount positive stop, load capacity up to 75 lbs. mounted on white steel standards, equal to Knape & Vogt 255-WH.
5. The diameter of the standard shelf pins shall be 5 mm by 22 mm long. They shall be drilled into cabinet sides as shown on the Drawings for shelf adjustment as shown on Drawings.

2.02 WORK SURFACES

A. Plastic Tops:

1. Plastic tops shall be 1-1/2" thick solid core particleboard. Surface material of plastic shall be laminated to solid core with water-resistant glue and heavily pressed to core for a thorough bond. Plastic patterns shall be as selected. Front and side edges shall be trimmed with plastic. Backsplashes shall be properly secured to deck and the joint sealed to insure against water leakage. Top and sides of backsplashes shall be trimmed with plastic. Tops to be triple-cove. Bottoms or countertops to have neutral backer sheet.

PART 3 - EXECUTION

3.01 EQUIPMENT DELIVERY AND INSTALLATION

A. Contractor shall be required to deliver, unpack, set in place and completely assemble all items ready for final utility connections by others. Contractor shall remove all packing cartons from the building and site. Items to be properly leveled and anchored to floor or wall as required. All common carrier deliveries shall be unloaded by the Contractor's installation personnel, or arranged for. All deliveries shall be to the job site. Equipment enclosed in cartons or crates shall be plainly marked as to item number, room, purchase order number, dealer or manufacturer.

B. After installation, all equipment shall be inspected and tested under operating condition. If

inspection or test shows defects, such defects shall be corrected and inspection and test repeated.

3.02 CLEAN-UP

A. Contractor shall remove any and all packing cartons, crates, packing materials and other debris from the building and site. All floors shall be broom cleaned after each work period. Failure to do so will result in a back charge applied against the vendor's Contract amount.

3.03 PROTECTION OF STORED EQUIPMENT

A. All equipment delivered to, and installed on this Project shall be suitably stored and protected. The areas to be used for storage shall be only as approved by the Owner and so not to interfere with other work.

B. The Owner and/or Architect will not assume responsibility for stored equipment. The ownership and title to equipment shall not be vested in the Owner before the equipment has been delivered, installed and set in place per the Drawings and Specifications.

3.04 PROTECTION OF INSTALLED EQUIPMENT

A. Each vendor shall assume the responsibility for the protection of all equipment under his Contract. Each vendor shall repair and restore any and all damage of his installed equipment to its original state. Where responsibility can be fixed, the cost shall be borne by the party responsible.

3.05 SAFETY REQUIREMENTS

A. Precaution shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery equipment and all hazards shall be guarded or eliminated in accordance with safety provisions of the Manual of Accident Prevention in Construction, published by the Association of General Contractors of America and Federal Safety and Health Regulations for Construction as issued by the Department of Labor.

3.06 BUILDING DAMAGE

A. Damage to the building, walls, floors, ceilings, hardware, fixtures, doors, etc., by installation personnel will be so noted and the cost to repair that damage will be borne by the Contractor responsible.

END OF SECTION

SECTION 06 60 00
SOLID POLYMER FABRICATIONS

PART 1 - GENERAL

1.01 GENERAL

A. Work described in this Section:

1. Integral vanity tops and bowls

B. Related work specified elsewhere:

1. Division 5 Section 05 50 00 – Metal Fabrications
2. Division 6 Section 06 10 00 – Rough Carpentry

1.02 DEFINITION

A. Solid surface is defined as nonporous, homogenous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.03 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability of successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.04 SUBMITTALS

A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

1. Show full size details, edge details, thermoforming requirements, attachments, etc.
2. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.

B. Samples: Submit minimum 6" x 6" (156 mm x 156 mm) samples showing color and pattern variation. Approved samples will be retained as a standard for work.

C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.

D. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.

1. Maintenance kit shall for finishes shall be submitted.

E. NSF/ANSI standards:

1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food

zone – all food types.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to Project site until areas are ready for installation. Store indoors.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications:

1. Work of the section shall be by a certified fabricator/installer, certified in writing by the same manufacturer.

C. Applicable standards: Standards of the following, as referenced herein.

1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM).
3. National Electrical Manufacturers Association (NEMA).
4. NSF International.

D. Allowable tolerances:

1. Variation in component size: + 1/8" (3mm).
2. Location of openings: + 1/8" (3mm) from dictated location.

E. Fire test response characteristics:

1. Provide with the following Class A (Class 1) surface burning characteristics as determined by testing identical products per UL 723 (ASTME84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. 1) Flame Spread Index: 25 or less.
   b. 2) Smoke Developed Index: 450 or less.

1.07 WARRANTY

A. Provide manufacturer's warranty. The manufacturer shall warrant to the original purchaser of any solid surface product for commercial use that the manufacturer will repair or replace, without charge, such product if it fails due to a manufacturing defect during the first 10 years after initial installation. This shall include reasonable labor charges needed to repair or replace the product covered hereunder.

B. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.01 SOLID POLYMER FABRICATIONS

A. Design is based on "Corian" by E.I. DuPont De Nemours & Co., Inc.

B. Acceptable products:

1. E.I. Du Pont De Nemours & Co., Inc.: "Corian."
2. Avonite, Inc.: "Avonite."
3. LG-Chem / Solid Source, HI-MACS.

C. Material: Cast, filled polymer; not coated, nonporous, laminated or of composite construction with though body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.

1. Superficial damage to a depth of 0.010" (.25 mm) shall be repairable by sanding or polishing.

D. Integral vanity tops and bowls: Vanity top of solid polymer, complete with integral, cast bowls of solid polymer, having edge details as indicated on the Drawings. Provide complete with backsplash of size shown on the Drawings; Sizes as shown on the Drawings and color to be chosen by Architect from the manufacturer's standard palette.

E. Window sills: [1/2" (13 mm)] thick solid polymer, adhesively, joined with no exposed seams, having edge details as indicated on the Drawings; color to be chosen by Architect from the manufacturer's standard palette.

F. Performance characteristics:

PROPERTY	REQUIREMENT	TEST PROCEDURE
Tensile Strength	6000 psi	ASTM D 638
Tensile Modulus	1.5×10^{-6} psi	ASTM D 638
Elongation	o.4% min.	ASTM D 638
Flexural Strength	10,000psi	ASTM D 790
Flexural Modulus	1.2×10^{-6} psi	ASTM D 790
Hardness	>85	Rockwell
		"M" scale
		ASTM D 785
	56	Barcol
		Impressor
		ASTM D 2583
Gloss (60 degree	5-75	ANSI Z124-1980
	(matte – highly polished)	
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Gardner)		HUD Bulletin
		UM-73-84
Color Stability	No change,	NEMA LD3
	200 hours	
Wear and Clean	Passes	ANSI Z124.3 and ANSI Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 and ANSI Z124.6
Fungus and Bacteria	Does not support	ASTM G21 and G22
Resistance	micro-bacterial growth	
Flammability	ASTM E 84	
	All Colors (Class 1 and Class A)	

	1/4"		1/2"	3/4"
	Masonry	Gypsum	Sheet	Sheet
Flame Spread	15	25	5	5
Smoke Developed	20	25	10	15

Class	1	1	1	1

PROPERTY	REQUIREMENT	TEST PROCEDURE
Water Absorption	Long-term	ASTM D 570
Weight (% Max.)	0.4% (3/4")	
	0.6% (1/2")	
Izod Impact	0.28 ft.lbs/in. of notch	ASTM D 256 (Method A)
Impact Resistance	No fracture	NEMA LD3
Sheets	1/4" slab-36" drop	1/2 lb.ball
	1/2" slab-36" drop	1 lb. ball
	3/4" slab-36" drop	2 lb. ball
Impact Resistance	No cracks or chips	ANSI Z124-1980
Bowls		HUD Bulletin
		UM-73-84
Thermal Expansion	3.02×10^{-5} in./in./°C	ASTM D 696
	(1.80×10^{-5} in./in./°F	
Boiling Water Surface Resistance	No visible change	NEMA LD3-2000
High Temperature Resistance (500%F)	No change	NEMA LD3-2000
Weatherability	$\Delta E^{*}_{94<5}$ in 1,000 hrs.	ASTM G 155
Specific Gravity**	1.7 standard colors	ASTM D 570
	1.69 Sierra colors	

**Approximate weight per square foot for standard colors: 1/4" (6mm), 2.2 lbs; 1/2" (12.3 mm), 4.4 lbs; 3/4" (19 mm), 7.0 lbs.

2.02 ACCESSORY PRODUCTS

A. Joint adhesive: Manufacturer's standard one or two-part adhesive kit to create inconspicuous, non-porous joints.

B. Panel adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1-1967 and UL listed.

C. Sealant: Manufacturer's standard mildew-resistant, FDA-complaint, NSF 51-compliant (food zone – any type), UL listed silicone sealant in colors matching components.

2.03 FABRICATION

A. Factory fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.

B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints.

1. Reinforce with strip of solid polymer material, 2" wide.

C. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.

D. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.

E. Cove backsplashes: Field fabricate 1/2" (13 mm) radius cove at intersection of counters and backsplashes. Form backsplashes using 1/2" (13 mm) solid polymer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

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

3.02 INSTALLATION

A. Install components plumb and level, scribe to adjacent finishes, in accordance with approved shop drawings and product installation data.

B. Exposed joints and seams shall not be allowed.

C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

D. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.

E. Cut and finish component edges with clean, sharp returns.

F. Rout radii and contour to template.

G. Anchor securely to base cabinets or other supports.

H. Align adjacent countertops and form seams to comply with manufacturers written recommendations using adhesive in color to match countertop.

I. Carefully dress joints smooth, remove surface scratches and clean entire surface.

J. Install countertops with no more than1/8" (3mm) sag, bow or other variation from a straight line.

K. Adhere window sills to substrate using manufacturer's recommended adhesive.

L. Provide backsplashes and sidesplashes as indicated on the Drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant.

M. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Replace stained components.

N. Coordinate countertop installation with plumbing installation by Plumbing Contractor.

O. Protect surfaces from damage. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.

END OF SECTION

SECTION 07 21 00
VAPOR RETARDERS AND BUILDING INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. All thermal and moisture protection required for this Work including, but not necessarily limited to:
    a. General building insulation
    b. Sound batt insulation
    c. Wall polyethylene vapor retarder
        i. All new exterior insulated stud walls shall have vapor barrier installed.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIRMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section 01 81 13 LEED Requirements. LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR2.1 and MR2.2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4.1 and MR 4.2: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5.1 and MR 5.2: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit EQ 4.1, EQ 4.2, EW 4.3 and EQ 4.4: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 SUBMITTALS

A. Submit technical data indicating thermal conductance factors of furnished insulation.

B. Submit samples: two 6" x 6" pieces of each type and thickness of rigid insulation.

C. Submit manufacturer's recommended installation instructions.

D. Submit manufacturer's certification that materials meet Specification requirements.

E. Manufacturer's Product Data:

1. Most recent copy of manufacturer's literature applicable to products and specifications to be used, including material characteristics, test data, installation recommendations, material safety data sheets (MSDS).

F. LEED Submittals:

1. Credit MR4.1 and MR4.2: Product Data indicating percentage by weight of recycled content for products having recycled content.
    a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5.1 and MR 5.2: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

3. Credit EQ 4.1, EQ 4.2, EQ 4.3, and EQ 4.4: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.04 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the Work and materials of all other trades.

B. Delivery and Storage:

1. Deliver materials to the Project Site, and store in a safe dry place with all labels intact and legible at time of installation.

C. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. General:

1. All reference to R-Values shall mean aged R-Values.

B. Hollow metal door frame stop insulation

1. At all hollow metal door frames to receive weather stripping furnish to door frame installers:
   a. Equivalent of Polytect Expanded Polystyrene as manufactured by Plymouth Insulation.
   b. R-value: R4 per inch of thickness
   c. Compressive Strength: 10 PSI

C. Other Materials

1. Where so indicated on the Drawings, furnish and install.
   a. Rigid Wall Insulation:
      i. Exterior Walls:
         (a.) 2" thick extruded polystyrene
         (b.) R-Value: R5 per inch of thickness
         (c.) Compressive Strength: 25 PSI

2. Sound Batt Insulation

3. General Insulation:
   a. At areas requiring general building insulation, use glass fiber batts having a thermal resistance "R" value of:
      i. R13 for walls with 3.5/8" batt insulation
      ii. R19 for walls with 6" batt insulation

2.02 ADHESIVE

A. As recommended by insulation manufacturer.

2.03 MECHANICAL FASTENERS

A. As recommended by insulation manufacturer.

B. Minimum length 1/2" longer than insulation thickness

2.04 VAPOR BARRIER

A. Sheet membrane for exterior stud walls and ceilings shall be 6 mil clear polyethylene.

PART 3 - EXECUTION

3.01 PREPARATION

A. Exterior Stud Walls:

1. Insulation installation shall be complete prior to placing vapor barrier membrane.

3.02 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Verify masonry joints where insulation is installed are struck flush.

C. Verify that openings in masonry walls are sealed. Cut insulation around vents, louvers, pipes, conduit, and other wall penetrations.

D. Verify that resilient rods or seals are in place around fixtures, pipes, receptacle outlets, and other items in or through the wall to seal openings.

E. Examine areas to receive rigid insulation to insure work of preceding trades is completed.

F. Check surfaces to receive rigid insulation to assure they are in uniform plane; and free of concrete fins, debris, grease, oil or other items detrimental to installation.

G. Proceed with application of insulation only when conditions are satisfactory.

3.03 INSULATION INSTALLATION

A. Except as otherwise specifically directed by the Architect/ Engineer, install all insulation in accordance with the current edition of "The Manufacturer's Application Instructions."

B. General:

1. Fit insulation snugly between framing.
2. Maintain integrity of insulation over entire area to be insulated.
3. Insulate small areas between closely spaced framing members.
4. Carefully cut and fit insulation around pipes, conduits, and other obstructions.
5. Where pipe or conduit are located in stud spaces, place insulation between exterior wall and pipe, compressing insulation where necessary.
6. Do not install insulation requiring compression in excess of 10%.
7. Install insulation to attain minimum R-value as indicated for finished assembly.

C. Mechanical Fasteners:

1. Install adhesively applied mechanical fasteners minimum of 48 hours prior to applying insulation.

D. Cavity Wall Insulation:

1. Place insulation with long dimension horizontal and mechanically fasten.

END OF SECTION

SECTION 07 41 50
METAL PANELS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: furnish and install preformed metal wall panels complete to provide a weather-tight installation. Include all necessary accessories including related flashings, fasteners, insulation, and closures.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 OUALITY ASSURANCE

A. Standards: Comply with standards specified in this Section.

B. Qualification of Manufacturers: Use products in the Work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

C. Qualifications of Installers: Use 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.

1.04 SUBMITTALS

A. General: Comply with provisions of Section 01 33 00 Submittal Procedures.

B. Manufacturer's Data: Within 30 calendar days after Award of Contract, submit:

1. Complete materials list of all items proposed to be furnished and installed under this Section;
2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
3. Shop Drawings for metal wall panel installation showing components, arrangements, dimensions, orientation on walls, sections of trim members, dimensioned elevations, grounds, reinforcements, and accessories.
4. Samples for each type metal wall panel and interior liner.

C. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
    a. Indicate quantity each of post-industrial or post-consumer recycled content.
    b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Liner Panel (Installed horizontally)
    1. 9" O.C. ribbed panel to match existing panel in the Scenario Training Room.
        a. Color: to be selected by architect from manufacturers standard color palette.

2.02 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Panels, sub-girts, flashings, etc., shall be erected in the direction as shown on the Drawings in a manner so that in the future panels can be removed and relocated with a minimum loss of panel. No welding of panels to structure will be acceptable. The panel manufacturer will be held responsible for the quality of the panels and the completed installation. Should the erection of the panels be sloppy or marred, etc., the Owner will hold the Contractor responsible for replacement or correction.

3.02 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to the approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.03 FINAL INSPECTION

A. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Provide firestopping systems consisting of a material, or combination of materials installed to retain the integrity of fire resistance rated construction by maintaining an effective barrier against the spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the building code for this Project.

B. Firestopping systems shall be used in locations including, but not limited to, the following:

1. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
2. Membrane penetrations in fire resistance rated wall assemblies where items penetrate on side of the barrier.

C. Related Sections include, but are not limited to, the following:

1. Division 4 Section 04 22 00 – Masonry Units
2. Division 9 Section 09 29 00 – Gypsum Board
3. Division 22 – Mechanical; Pipe and Duct
4. Division 26 – Electrical; Lighting, Power, Alarms, and Communications

1.03 REFERENCES

A. American Society For Testing and Materials Standards (ASTM):

1. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Firestops.
3. ASTM E 1966: Standard Test Method for Fire-Resistive Joint Systems.
4. ASTM E 1399: Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
5. ASTM E 119: Standard Test Methods for Fire Tests of Building Construction and Materials.
6. ASTM E 2307: Standard Test Method for Determining the Fire-Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus.

B. Underwriters Laboratories Inc. (UL):

1. UL 263: Fire Tests of Building Construction and Materials.
2. UL 723: Surface Burning Characteristics of Building Materials.
3. UL 1479: Fire Tests of Through-Penetration Fire Stops.
4. UL 2079: Tests for Fire Resistance of Building Joint Systems.

C. UL Fire Resistance Directory -Volume 2:

1. Through-Penetration Firestop Devices (XHJI)
2. Fire Resistive Ratings (BXUV)
3. Through-Penetration Firestop Systems (XHEZ)

4. Fill, Void, or Cavity Material (XHHW)

D. Omega Point Laboratories (OPL)
   1. Building Products, Materials & Assemblies – Volume II

E. Factory Mutual Research Approvals (FM):
   1. FM 4991: FM Approval Standard of Firestop Contractors – Class 4991

1.04 DEFINITIONS

A. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.

B. System: The use of a specific firestopping material or combination of materials in conjunction with a specific wall or flow construction type and a specific penetrant(s).

C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

D. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.

E. Membrane-penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.

F. Fire Resistive Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.

G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and a non-rated exterior wall assembly.

1.05 PERFORMANCE REQUIREMENTS

A. Penetrations: Provide through-penetration firestopping systems that are produced and installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.
   1. Provide and install complete penetration firestopping systems that have been tested and approved by nationally accepted testing agencies per ASTM E 814 or UL 1479 fire tests in a configuration that is representative of field conditions.
   2. F-Rated Systems: Provide through-penetration firestopping systems with F-ratings indicated, as determined per ASTM E 814 or UL 1479, but not less than one (1) hour or the fire resistance rating of the assembly being penetrated.
   3. T-Rated Systems: Provide through-penetration firestopping systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814 or UL 1479, where required by the Building Code.
   4. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestopping systems.
   5. For penetrations involving insulated piping, provide through-penetration firestopping systems not requiring removal of insulation.

B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as determined by UL 2079 (ASTM E 1399 and E 1966), but not less than the fire resistance assembly rating of the construction in which the joint occurs. Firestopping assemblies must be capable of withstanding anticipated movements for the installed field conditions.
   1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

C. Firestopping products shall have flamespread ratings less than 25 and smoke-developed ratings less than 450, as determined per ASTM E 84.

D. Where there is no specific third party tested and classified firestopping system available for an installed condition, the firestopping contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the approving authority and authority having jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines.

1.06 SUBMITTALS

A. Product Data: For each type of firestopping product selected. Certify that firestopping materials are asbestos-free and contain volatile organic compounds (VOCs) within limits of the local jurisdiction.

B. Design Listings: Submit system design listings, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestopping configuration.

C. Where there is no specific third party tested and classified firestopping system available for a particular configuration, the firestopping contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) for submittal.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Submit document from manufacturer wherein manufacturer recognizes the installer as qualified.

1.07 QUALITY ASSURANCE

A. Provide firestopping system design listings from UL or OPL in accordance with the appropriate ASTM Standard(s) per Article 1.5.

B. Contractor Qualifications: An acceptable installer shall either be:

1. FM Research approved in accordance with FM Standard 4991 – Approval of Firestop Contractors, or
2. Meet any two of the following requirements
   a. Licensed by state or local authority where applicable,
   b. Trained and approved by the firestopping manufacturer,
   c. Shown to have successfully completed not less than 5 comparable scale projects.

C. Single Source Limitations: Obtain firestopping systems, for each kind of penetration and construction condition indicated from a single manufacturer, where possible.

D. Materials from different firestopping manufacturers shall not be installed in the same firestopping system or opening.

E. Firestopping material shall be asbestos- and lead-free and shall not incorporate nor require the use of hazardous solvents.

F. Firestopping sealants must be flexible, allowing for normal pipe movement.

G. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces such that a void is created.

H. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

I. Materials used shall be in accordance with the manufacturer's written installation instructions.

J. Label each firestopping system installation with the following information:

1. Firestopping product name
2. System listing number
3. Date of installation
4. Installer name
5. Statement on label reading, "Warning: Firestop System – Do Not Disturb. Notify

Building Management of any Damage."

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture, lot number, UL or OPL classification marking, and mixing instructions for multi-component materials.

B. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. All firestopping materials shall be installed prior to expiration of shelf life.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within limits permitted by the manufacturer's written instructions. Do not install firestopping when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate per the manufacturer's written instructions on the product's Material Safety Data Sheet.

C. Verify the condition of the substrates before starting work.

D. Care should be taken to ensure that firestopping materials are installed so as not to contaminate adjacent surfaces.

1.10 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed according to specified requirements.

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

C. Do not conceal firestopping installations until the Owner's inspection agency or authorities having jurisdiction have examined each installation.

D. Schedule firestopping after installation of penetrants but prior to concealing the openings.

PART 2 - PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Firestopping products specified in system design listings by UL or OPL may be used providing they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate assembly.

B. Manufacturer of firestopping products shall have been successfully producing and supplying these products for a period of not less than three years and be able to show evidence of at least ten projects where similar products have been installed and accepted.

C. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by the firestopping manufacturer and approved by UL or OPL for the firestopping systems indicated. Accessories include, but are not limited to the following items:

1. Permanent forming/damming/backing materials, including the following:
    a. Slag wool fiber insulation.
    b. Foams or sealants used to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Polyethylene/polyurethane backer rod.
    e. Rigid polystyrene board.

2. Temporary forming materials.
3. Substrate primers.
4. Steel sleeves

D. All firestopping products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed.

2.02 MIXING

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

2.03 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following:
1. Grace Construction Products, 62 Whittemore Ave, Cambridge MA 02140, (866) 333-3726.
2. Nelson Firestop Products, P.O. Box 726, Tulsa OK 74101, (918) 627-5530.

2.04 MATERIALS

A. Intumescent Firestop Sealants and Caulks:
1. FlameSafe FS1900
2. Nelson LBS

B. Elastomeric Water-Based Sealant
1. FlameSafe FS1900, FS900+
2. Nelson LBS, ES1399

C. Firestop Putty:
1. FlameSafe FSP1000 Putty & FSP1077 Putty Pads
2. Nelson FSPFirestop Devices:
3. FlameSafe FSWSD Collar, FSIS Intumescent Sleeve, FlameSafe FSD Device
4. Nelson PCS Collar

D. Wrap Strips:
1. FlameSafe FSWS 100 Wrap Strip, FSWS 150 Wrap Strip
2. Nelson WRS Wrap Strip

E. Firestop Mortars:
1. FlameSafe FSM Mortar
2. Nelson CMP Mortar

F. Firestop Bags/Pillows:
1. FlameSafe Bags, FlameSafe Pillows
2. Nelson PLW Pillows

G. Elastomeric Coating:
1. FlameSafe FS3000
2. Nelson FSC3

H. Forming/Damming Materials: FlameSafe Mineral Wool or other type as per manufacturer's recommendations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

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

C. Verify that all pipes, conduits, cables, and/or other items which penetrate fire-rated construction have been permanently installed prior to installation of firestopping.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing firestopping systems to comply with written recommendations of firestopping manufacturer and the following requirements:

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

3.03 PENETRATION FIRESTOP SYSTEMS

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

B. Installation of firestopping shall be performed by an applicator/installer qualified as described in Article 1.7.

C. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer's EJ per the manufacturer's installation instructions.

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

E. Install fill materials for firestopping systems by proven techniques to produce the following results:

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

3.04 JOINT FIRESTOP SYSTEMS

A. General: Install fire resistive joint firestopping systems to comply with "Performance Requirements" Article in Part 1 and firestopping manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Installation of firestopping shall be performed by an applicator/installer qualified as described in Article 1.7.

C. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer's EJ per the manufacturer's installation instructions.

D. Install joint forming/damming materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional

shapes and depths of installed firestopping material relative to joint widths that allow optimum movement capability and achieve fire resistance ratings required.

E. Install fill materials for firestopping systems by proven techniques to produce the following results:
   1. Fill joint as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they fully contact and adhere to substrates forming the openings.
   3. Completely fill recesses provided for each joint configuration.
   4. Tool non-sag firestopping materials after their application and prior to the time skinning begins. Use tooling agents approved by the firestopping manufacturer.

3.05 PERIMETER BARRIER FIRESTOP SYSTEMS

A. General: Install perimeter barrier firestopping systems to comply with "Performance Requirements" article in Part 1 and firestopping manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Installation of firestopping shall be performed by an applicator/installer qualified as described in Article 1.7.

C. Apply firestopping in accordance with UL or OPL listed system designs or manufacturer's EJ per the manufacturer's installation instructions.

D. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestopping materials as applicable within the system design.

3.06 FIELD QUALITY CONTROL

A. Inspecting Agency: The building inspector, if required by authorities having jurisdiction, shall be allowed to inspect firestopping systems. All areas of Work must be accessible until inspection by the applicable code authorities.

B. Proceed with enclosing firestop systems with other construction only after inspections are complete.

C. Where deficiencies are found, repair or replace firestopping systems so they comply with requirements.

3.07 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not damage materials in which openings occur. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

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

END OF SECTION

SECTION 08 11 00
STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all standard and non-standard steel doors and steel door frames delivered to the site.

B. Related Work Described Elsewhere:

1. Section 08 70 00: Finish Hardware
2. Section 09 29 00: Gypsum Wallboard
3. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
4. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.1 and IEQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. Comply with applicable standards specified:
   a. Underwriters Laboratories (UL)
   b. Factory Mutual (FM)
   c. American National Standards Institute (ANSI)
   d. American Society for Testing and Materials (ASTM)
   e. Federal Specifications (FS)
2. Qualifications of Manufacturer:
   a. Products used in this work of this Section shall be produced by manufacturer regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.
3. Qualifications of Installers:
   a. Use adequate numbers 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.

4. Single Source:
   a. All work of this Section shall be produced by a single manufacturer unless otherwise approved by the Architect.

1.04 SUBMITTALS

A. General:
   1. Comply with provisions of Section 01 33 00.

B. Manufacturers' Data:
   1. Within 15 calendar days after award of the Contract, submit:
      a. Complete materials list of all items proposed to be furnished and installed under this Section.
      b. Manufacturers' specifications and other data required to demonstrate compliance with the specified requirements.
      c. Shop Drawings showing details of each frame type, elevations of each door design type, details of all openings, and all details of construction, installation, all anchorage.
   2. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting or rejecting actual installation procedures used on the work.

C. LEED Submittals:
   1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
      a. Indicate quantity each of post-industrial or post-consumer recycled content.
      b. Include statement indicating costs for each product having recycled content.
   2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
   3. Credit IEQ 4.1 and IEQ 4.4: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 PRODUCT HANDLING

A. Protection:
   1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements:
   1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no addition cost to the Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS (FOR ALL STEEL DOORS UNLESS NOTED OTHERWISE)

A. Pioneer Fireproof Door Corporation - Mt. Vernon, New York.

B. Aetna Steel Products Corporation - New York, New York.

C. Williamsburg Steel Products - Brooklyn, New York.

D. Atlantic Metal Products, Inc. - Yonkers, New York.

E. Firedoor Corporation of America, Inc. - New York, New York.

F. Superior Fireproof Door & Sash Company - New York, New York.

G. Trussbilt Division, Siems Brothers, Inc. - St. Paul, Minn.

H. Ceco Corporation - Chicago, Illinois.

I. Steelcraft Manufacturing Company - Cincinnati, Ohio.

J. Fenestra - Erie, Pennsylvania.

K. Precision Metals - Milwaukee, WI

2.02 DOORS 122C, 122D, 122E

A. Curries 747 Series – Steel Stiffened Door or approved equal.

B. 16 Gauge Top and Bottom Channels

C. 16 Gauge Rib Stiffeners

D. 14 Gauge Face Skin spot welded to ribs at 6" max. spacing

E. 12 Gauge Hinge Channel

F. 14 Gauge Lock Channel

G. Fiberglass Insulation between stiffeners

H. 14 Gauge Closer Reinforcement Channel

2.03 STEEL FABRICATION

A. Carbon Steel: Cold rolled, ASTM A 366.

2.04 CORE FILLER MATERIAL:

A. Manufacturer's Standard fibrous honeycomb for interior doors and urethane insulation for exterior doors.

2.05 ANCHORS, FASTENERS HARDWARE AND ACCESSORIES

A. Manufacturer's standard.

2.06 OTHER MATERIALS

A. All other materials not specifically described but required for the complete and proper installation of the word of this section shall be new, first quality for their respective kinds and subject to approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

A. Inspection:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point when this installation will properly commence.
2. Verify that all hollow metal work may be installed in accordance with all product codes and regulations, the original design and their referenced standards.

3.02 FABRICATION

A. General:

1. Fabricate hollow metal work to be rigid, neat in appearance, and free from defects, warp or buckle.
2. Completed fabrications to meet ANSI A151.1.
3. Accurately form metal to required sizes and profiles, including astragals if utilized.
4. Clearly identify work that cannot be permanently factory assembled before shipment to assure proper assembly at project site.
5. Grind and dress exposed welds to form smooth, flush surfaces.
6. Do not use metallic filler to conceal manufacturing defects.

B. Doors:

1. Interior Doors
    a. Form interior face sheets of 18 gauge metal.
    b. Stiffener:
    c. Stiffen face sheet with continuous vertical formed steel sections over full thickness of interior space between door faces.
    d. Stiffeners of 22 gauge minimum, spaced not more that 6" apart, spot welded to both face sheets not more that 4" o.c.
    e. Fill spaces between stiffeners with core material.
    f. Join door faces at vertical edges by mechanical interlock.
    g. Coating Materials:
        i. Primer: Manufacturer's galvanized rust inhibitive primer.
2. Exterior Doors:
    a. Form exterior face sheets of 16 gauge galvanized steel.
    b. Stiffener:
    c. Stiffen face sheet with continuous vertical formed steel sections over full thickness of interior space between door faces.
    d. Stiffeners of 22 gauge minimum, spaced not more that 6" apart, spot welded to both face sheets not more that 4" o.c.
    e. Fill spaces between stiffeners with core material.
    f. Join door faces at vertical edges by mechanical interlock.
    g. Coating Materials:
        i. Exterior doors shall be 16 gauge galvanized steel with sealed flush top caps.

C. Welded Frames
1. Interior Frames:
    a. 16 gauge
    b. Diecut mitered corners with interlocking tabs and slots for alignment.
    c. Fabricated with mitered joints for installation after wall is erected.
    d. Coating Materials:
        i. Primer: Manufacturer's galvanized rust inhibitive primer.
2. Exterior Frames:
    a. Exterior frames to be 14 gauge galvanized steel.
    b. Diecut mitered corners with interlocking tabs and slots for alignment.
    c. Fabricated with mitered joints for installation after wall is erected.
    d. Coating Materials:
        i. Exterior doors shall be 16 gauge galvanized steel with sealed flush top caps.

D. Anchors: Wire, T-Strap, or Pin type (Masonry, Steel Stud & Existing Wall Anchors).

E. Dust Cover Boxes: Minimum 26 gauge at hardware mortises.

3.03 EDGE CLEARANCES

A. Between doors and frame at head and jamb: 1/8"

B. At sills without thresholds: 3/4" maximum

C. At sills with thresholds: 1/4" maximum between threshold and door.

D. Between meeting edges of pairs of doors: 1/8".

3.04 PREPARATION FOR HARDWARE

A. ANSI A 115.

3.05 FINISH

A. Dress tool marks and surface imperfections to smooth surfaces, and remove irregularities.

B. Chemically treat and clean doors and frames.

C. Apply manufacturer's standard primer.

3.06 INSPECTION

A. Assure that frame openings correspond to dimensions of frame furnished.

B. Check that surfaces to contact frame are free of debris.

C. Do not proceed with installation until unsatisfactory conditions are corrected.

3.07 INSTALLATION

A. Anchorage:
   1. Attach anchor to opening.
   2. Minimum number of anchors:
      a. Masonry Walls, Concrete Walls & Structural Steel:
         i. Frames up to 7'-6"" 3 anchors per jamb.
         ii. Frames 7'-6" to 8'-0": 4 anchors per jamb.
         iii. Frames more than 8'-0": 1 anchor for each 2" or jamb or fraction thereof.
      b. Stud partitions:
         i. Frames up to 7'-6": 3 anchors per jamb
         ii. Frames 7'-6" to 8'-0" 4 anchors per jamb
         iii. Frame more than 8'-0": 4 anchors plus one additional anchor for each 2' or fraction thereof over 8'-0".
   3. Frames: SDI 105
   4. Hardware: SDI 107
   5. Doors: SDI 100.

B. Exterior Door Frames:
   1. These frames shall be filled with batt insulation before installation.

3.08 ADJUSTMENT AND CLEANING

A. Remove dirt and excess sealants or glazing compound from exposed surfaces.

B. Touch-up marred or abraded surfaces to match original finish.

C. Adjust moving parts for smooth operation.

D. Remove debris from project site.

3.09 GUARANTEES

A. Guarantee doors and frames against failure of materials or workmanship to include excessive leakage of air infiltration, excessive deflections, faulty operation of sash, deterioration of finish or metal in excess of normal weathering, and defects in hardware and weatherstripping.

B. Guarantee to extend for two years.

END OF SECTION

SECTION 08 11 16
ALUMINUM DOORS, FRAMES & WINDOWS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Specified Elsewhere:
   1. Section 07 92 00 – Joint Sealers
   2. Section 08 80 00 – Glazing
   3. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
   4. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

B. Furnish and install aluminum doors and frames as shown on the drawings and specified herein for a complete and proper installation.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:
   1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
   2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
   3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. For purposes of designating type and quality for work in this section, drawings and specifications are based on Kawneer. Whenever substitute products are to be considered, supporting technical literature, samples and drawings must be submitted five (5) days prior to bid date in order to make a valid comparison of the products involved.

1.04 SUBMITTALS

A. Shop Drawings:
   1. Within 15 days after award of contract, and before any of the materials of this Section are delivered to the job site, submit complete shop drawings to the Architect/Engineer in accordance with the provisions of Section 01 33 00 of these specifications; show construction of all parts, metal thickness, installation and erection details including connections, anchorage, fastentening and sealing methods. Also show sections of typical members, dimensions and elevation, frame sizes, spacing of anchors and fasteners, and details of accessories.

B. Manufacturer's Recommendations:
   1. Submit two copies of the manufacturer's recommended methods of installation for aluminum doors and frames.

C. Samples:
   1. Accompany the shop drawings, submit samples of the proposed aluminum finishes to the Architect/Engineer.

D. LEED Submittals:

1. Credit MR4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacement:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architects/Engineer and at no additional cost to the Owner.

1.06 GUARANTEES

A. Guarantee doors and frames against failure of materials or workmanship to include excessive leakage of air infiltration, excessive deflections, faulty operation of sash, deterioration of finish or metal in excess of normal weathering, and defects in hardware and weatherstripping.

B. Guarantee to extend for 2 years.

PART 2 - PRODUCTS

2.01 DOOR AND WINDOW FRAMES

A. All frames shall be the product of EFCO.

1. Interior fixed window – 403 series 2" x 4 ½" able to accept 1/4" tempered glass.
2. Aluminum doors – D500 wide stile door

2.02 ALUMINUM (ENTRANCES AND COMPONENTS):

A. Material Standard: ASTM B 221; 6063-T5 alloy and temper.

B. Major portions of the door members to be .125" nominal in thickness and glazing molding to be .050" thick.

C. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association.

D. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.

E. Provide adjustable glass jacks to help center the glass in the door opening. A. Fasteners: Where exposed, shall be aluminum, stainless steel or plated steel.

F. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.03 STANDARD ENTRANCE HARDWARE

1. Hinges, Stainless Steel, 5-knuckle ball bearing
2. Weatherstripping: Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
3. The door weatherstripping butt hung door and frame (single or pairs) shall have a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
4. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied

to the interior exposed surface of the bottom rail with concealed fasteners. Threshold: Extruded aluminum, one piece per door opening, with ribbed surface.

5. Adams Rite entrance/exit hardware, equivalent manufacturer to be Von Duprin, Precision or Dor-O-Matic.

2.04 DOOR SCHEDULE

Interior Door 112

1 Adams Rite Deadlatch Paddle 4591

Provide (2) paddles per door – (1) push and (1) pull

Provide hex key for paddle dogging

1 Closers: Provide LCN 4020 Series Surface Mounted (Push-Side), finish to match aluminum door frame color.

2.05 ALUMINUM WINDOWS:

A. Material Standard: ASTM B 221; 6063-T5 alloy and temper.

B. 403 Series Framing System – 2" x 4½" nominal dimension.

2.06 ALUMINUM EXTRUSIONS

A. ASTM B221-76a.

B. Alloy 6063.

C. Temper T5.

2.07 ALUMINUM FINISH

A. All exposed surfaces shall be free of scratches and other serious blemishes.

B. Finish shall be bronze anodized.

2.08 CARBON STEEL

A. Shapes, plates and bars: ASTM A-36-77a.

B. Sheets:

1. ASTM A 446-76.
2. Zinc coating: ASTM A 525-77.

2.09 OTHER MATERIALS

A. All other materials, not specifically described, but required for a complete and proper installation of the work of this Section, shall be new, first quality for their respective kinds and subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 PRIOR CONDITIONS

A. Inspection:

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that all aluminum doors and frames may be installed in accordance with all pertinent codes and regulations, the original design and the referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect/Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION

A. General:

1. Install all aluminum doors, frames, and hardware in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer. Conform to revised shop drawings.

3.03 MECHANICAL ASSEMBLIES

A. Fit corner joints rigid and weathertight.

B. Fasteners concealed when door is installed and closed.

3.04 PROTECTIVE COATINGS

A. Factory applied.

B. Solvent-clean metal surface.

C. Apply Bituminous Paint to aluminum in contact with galvanically incompatible metal.

D. Apply Zinc Chromate Primer to aluminum surfaces to be installed in contact with concrete or mortar.

3.05 WEATHER STRIP

A. Weather Strip on all sides installed on door.

B. Weather stripping to be continuous at corners.

3.06 INSPECTION

A. Assure that door openings conform with dimensions and tolerances shown on plans.

B. Check that surfaces to contact doors are free of debris.

C. Do not proceed with installation until unsatisfactory conditions are corrected.

3.07 INSTALLATION

A. Comply with manufacturer's instructions for installation of units, hardware, operators, and other components.

B. Set units plumb, level and true to line, without warp or rack of frames.

C. Anchor frames solidly to surrounding construction to prevent distortion or misalignment.

D. Apply protective coating to separate aluminum from galvanic incompatible materials.

E. Use Lok-Tite on all screws.

3.08 ADJUST AND CLEAN

A. Adjust movable units to operate smoothly and to be weathertight when closed.

B. Lubricate hardware and moving parts.

C. Clean aluminum surfaces and remove excess sealants.

D. Remove debris from work site.

END OF SECTION

SECTION 08 14 00
WOOD DOORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The General Provisions of the Contract including General and Supplemental Provisions, Special Provisions and Division 1 - General Requirements, apply to work specified in this Section.

B. Related Work Specified Elsewhere:

1. Division 8 Section – Steel Doors & Frames.
2. Division 8 Section – Finish Hardware
3. Division 8 Section – Door & Hardware Installation
4. Division 8 Section – Glass and Glazing
5. Division 9 Section – Gypsum Board
6. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
7. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.4: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.
5. Credit MR 7: Certified Wood: See Division 1 Section "LEED Requirements" for material requirements.

1.03 QUALITY ASSURANCE

A. Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction. All material supplied for this project shall conform to the AWI Section 1300 and NWWDA I.S. 1 for product quality standards. Submit independent test reports upon request.

B. All labeled fire door assemblies shall be of a type which have been investigated and tested in accordance with NFPA 252 and UL10B. A physical label shall be permanently affixed to the fire door at an authorized facility. Furthermore, all A & B Label Doors to have minimum split resistance of 500 lbs. and direct screw withdrawal resistance of 700 lbs.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature, specifications, installation instructions, warranty form and other data required to indicate compliance with specified requirements.

B. Shop Drawings:
   1. Submit door schedule indicating opening, identifying number, door type, grade, size, thickness, swing, label requirements and undercuts.
   2. Include door elevations indicating type of construction and conditions at cutouts for vision panels and louvers.
   3. Detail full size molding sections.
   4. Indicate pre-fitting and pre-machining requirements including hardware locations.
   5. Use same reference numbers for openings and details.

C. Samples:
   1. Submit 12" corner samples of each type of door with selected veneer.
   2. Submit samples showing proposed factory finish, veneer, and selected color.

D. Comply with the provisions of Section 01 33 00.

E. LEED Submittals:
   1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
      a. Indicate quantity each of post-industrial or post-consumer recycled content.
      b. Include statement indicating costs for each product having recycled content.
   2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
   3. Credit IEQ 4.4 Low Emitting Materials: Documentation of urea-formaldehyde free resins used in fabrication of composite wood doors.
   4. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect during transit, storage and handling to prevent damage, soiling and deterioration.

B. Comply with manufacturer's instructions and with "On-Site Care" requirements of AWI pamphlet "Care and Finishing of Wood Doors."

C. Delivery: Deliver to site after wet construction operations are completed and dry and building has reached average prevailing relative humidity of locality.

D. Deliver pre-finished components in manufacturer's original unopened protective covering or container, clearly marked with manufacturer's name, brand name and identifying number on covering.

1.06 WARRANTY

A. Submit written warranty on manufacturer's standard form signed by official of door manufacturer agreeing to repair or replace defective doors which have:
   1. Delamination in any degree.
   2. Warp or twist of 1/4" or more in plane of door face.
   3. Telegraphing of stile, rail or core through face to cause surface variation in excess of 1/100" in any 1" span.
      a. When hanging doors, do not subject them to extremes of heat and/or humidity conditions. Relative humidity shall not be less than 30% nor more than 60%.

B. Warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of the defective doors.

C. Warranty shall be in effect for life of original installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Marshfield Door Systems, Marshfield, WI 54449

2.02 MATERIALS

A. Wood Doors:

1. Face: Rotary cut Birch (faces and crossbands shall be 5 ply hot press laminated to the prefabricated core using Type II highly water resistant adhesive). Veneer cut: Rotary. Core: Single thickness particleboard core complies with CS 236-66, Type 1, Density C and ANSI A208.
   a. Vertical Stiles: Matching hardwood stile edges 1-3/8" minimum after trim.
   b. Rail Edges: Mill hardwood, 1-1/8" minimum after trim.
   c. Adhesive: Exterior use, Type I; Interior use, Type II.
   d. Finish: AWI TR6
   e. Color: 500

B. Labeled Fire Doors:

1. Face: AWI Premium Grade Veneer to match non-rated doors, rotary cut birch.
2. Core: Non-combustible mineral.
3. Vertical Stiles: To be visually compatible with face veneer, minimum 1-1/8" thick.
4. Rail Edges: Top, 1-1/4" minimum treated; Bottom, 1-1/2" minimum treated.
5. Rating: C - 3/4 hr.; B - 1 hr.; B - 1-1/2 hr.; 20 minute, as indicated on door schedule in Drawings.

****All wood doors must be urea-formaldehyde free and comply with LEED IEQ Credit 4.4****

C. Vision Panels: Size as scheduled in Drawings.

D. Metal Vision Frames: BFL-123 Metal Vision Frames as manufactured by Anemostat or equal. Size as scheduled in Drawings. Color to be selected by Architect.

E. Framed non-glued drop-in cores are not approved.

2.03 FACTORY FINISHING

A. Pre-finish all wood doors on all six (6) sides at factory.

B. Comply with recommendations of AWI for factory finishing of doors utilizing finishes as manufactured by Algoma or equal and three coats of polyurethane. Architect to select color.

2.04 PREFITTING AND PREPARATION FOR HARDWARE

A. Pre-fit and pre-machine all wood doors at factory in accordance with final approved hardware and frame schedule.

B. Fire doors shall be machined in strict compliance to provisions of NFPA-80 latest edition.

C. Pre-machine doors within industry tolerances. A plus or minus 1/32" will be allowed on all hardware locations. A plus 1/32" 0-inch tolerance will be allowed on hinge cutouts. A plus 1/64" minus 0-inch tolerance will be allowed on lock front preparation cutouts.

2.05 FABRICATION

A. General:

1. Comply with AWI Quality Standards Section 1330 except to meet or exceed requirements herein specified.
2. Completely factory pre-fit to required size ready for installation at project site; no on-site trimming permitted.

3. Prepare in accordance with frame shop drawings and schedule, hardware schedule and templates.

B. Thickness: 1-3/4" thick unless indicated otherwise on door schedule.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine door frames and verify frames are of correct type and have been installed for proper hanging of corresponding doors.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Install fire rated doors in accordance with NFPA-80.

C. Install accurately in frame, within clearances specified. Install hardware in accordance with manufacturer's written instructions and associated templates. Refer to Section 08 70 00 for general installation requirements. Jobsite pre-finishing to be completed prior to installation of finish hardware. Backer plates with through-bolts shall be used for mounting closers.

D. Do not field cut doors down to opening sizes smaller than those for which doors were manufactured. Do not install door in frame set out of plumb.

E. Install to operate freely, but not loosely, free from hinge bound conditions, striking or binding. Do not install in frames which would hinder operation of doors. Hang free from rattling when in latched position.

3.03 ADJUSTING

A. Adjust and check each door to ensure proper operating and function.

B. Replace or re-hang doors which are hinge-bound and do not swing or operate freely.

C. Remove and replace doors which are warped, twisted, or which are not in true planes.

D. Replace pre-finished doors damaged during installation.

END OF SECTION

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following types of access doors:

1. Wall access doors.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section 09 29 00 - "Gypsum Board Assemblies" for gypsum board walls and ceilings.

1.03 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of access door assembly specified, including details of construction relative to materials, individual components, profiles, finishes, and fire-protection ratings (if required).

1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, latching or locking provisions, and other data pertinent to installation.

C. Shop drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage, and accessory items.

D. Samples, 3-inch (75-mm) by 5-inch (125-mm) minimum size, of each panel face material showing factory-finished color and texture.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain access doors for entire Project from one source and by a single manufacturer.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

1.05 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified under "Submittals" Article.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

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

1. Cesco Products.
2. J.L. Industries, Inc..
3. Karp Associates, Inc.

4. Larsen's Manufacturing Co.
5. Milcor, Inc.

2.02 MATERIALS

A. Steel Sheet: ASTM A 366/A 366M commercial-quality, cold-rolled steel sheet with baked-on, rust-inhibitive primer.

B. Zinc-Coated Steel Sheet: ASTM A 591/A 591M electrolytic zinc-coated steel sheet with Class C coating and phosphate treatment to prepare surface for painting.

C. Stainless-Steel Sheet: ASTM A 167, Type 304 with No. 4 finish according to ASTM A 480/A 480M.

2.03 ACCESS DOORS

A. Trimless, Flush Access Doors for Gypsum Board: Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:
   1. Size: 10" x 10"
   2. Frame: 0.0598-inch- (1.52-mm-) thick steel sheet.
   3. Door: 0.0747-inch- (1.90-mm-) thick steel sheet.
   4. Concealed, Gypsum Board Edge Trim: 0.0299-inch (0.76-mm) zinc-coated or galvanized-steel sheet with face flange formed to receive joint compound.
   5. Hinge: Concealed spring pin or continuous type.
   6. Locks: Screwdriver-operated cam.

2.04 FABRICATION

A. General: Manufacture each access door assembly as an integral unit ready for installation.

B. Steel Access Doors and Frames: Continuous welded construction. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. Exposed Flange: Nominal 1 to 1-1/2 inches (25.4 to 38.1 mm) wide around perimeter of frame.
   2. For gypsum board assemblies or gypsum veneer plaster, furnish frames with edge trim for gypsum board or gypsum base.
   3. For full-bed plaster applications, furnish frames with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
   4. For installation in masonry construction, furnish frames with adjustable metal masonry anchors.

C. Recessed Panel Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
   1. Furnish recessed panel doors for concealed installation in acoustical tile ceiling systems.
   2. Furnish recessed panel doors and frames with expanded metal lath for concealed installation in plaster.

D. Locking Devices: Furnish number required to hold door in flush, smooth plane when closed.
   1. For cylinder lock, furnish 2 keys per lock and key all locks alike.
   2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.01 PREPARATION

A. Advise Installers of other work about specific requirements relating to access door

installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

3.02 INSTALLATION

A. Comply with manufacturer's instructions for installing access doors.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.

C. Install concealed-frame access doors flush with adjacent finish surfaces.

3.03 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 70 00
FINISH HARDWARE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all finish hardware required to complete the work as indicated on the Drawings and specified herein. Provide all trim attachments, and fastening specified or required for proper and complete installation.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this Section as listed in Section 01 42 00.

B. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.

C. Qualification of Suppliers: The supplier shall have a qualified representative readily available to the Architect/Engineer, and/or Owner on short notice for consultation and service during the execution of this work and the warranty period.

D. Fire Rated Openings: Comply with the requirements of Underwriter's Laboratories, Inc.

1.04 SUBMITTALS

A. General: Comply with the provisions of Section 01 33 00.

B. Product Data: Within 15 calendar days after award of the Contract, submit:

C. Complete materials list of all items proposed to be furnished and delivered under this Section.

D. Identify each hardware item by manufacturer, the manufacturer's catalog number, and the location of the item in the work.

E. Make the list in form suitable for ready checking by the Architect.

F. Manufacturer's specifications, catalog cuts, and other data required to demonstrate

compliance with specified requirements.

G. Approval of the hardware list by the Architect/Engineer shall not relieve the Contractor from the responsibility for furnishing all required finish hardware.

H. Samples: Within 15 calendar days after being so requested by the Architect/Engineer, deliver to the Architect/Engineer samples of each finish hardware item.

I. Templates: In a timely manner to ensure orderly progress of the work, deliver templates or physical samples of the approved finish hardware items to pertinent manufacturers of interfacing items such as door and frame.

J. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT HANDLING

A. Packing and Marking: Individually package each units of finish hardware, complete with proper fastening and appurtenances, clearly marked on the outside to indicate the contents and specific locations in the work.

B. Protection: Use all means necessary to protect materials of this Section before, during, and after delivery to the job site and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the owner.

PART 2 - PRODUCTS

2.01 LOCKS, LATCHES AND DEAD LOCKS

A. Shall be Schlage:

1. ND Series Rhodes design Satin Chromium Plated
2. L-Series Mortise Locks

B. Backset shall be 2-3/4" for all locks, latches, and dead locks. Strike plates shall be box type with wide enough lip projection to protect door frame but not to exceed 3/16" beyond face of frame.

C. Lock function legend:

1.	Classroom Lockset	ND70PD
2.	Exit/Blank Lockset	ND25D
3.	Exit Lockset	ND12D
4.	Entrance / Office Lockset	ND50PD
5.	Passage Latch	L9010

Note: Functions are noted with hardware groups.

2.02 EXIT DEVICES

A. Devices shall be as manufactured by Von Duprin 98/99 Series

1. Series 98 – Smooth
2. PRO993 – Manually programmed exit trim
3. Lever Style - 06

B. Function shall be as noted in schedule.

2.03 BUTT HINGES

A. Shall be Hager, McKinney or Stanley ball bearing, non-rising loose pin, flat button tip, unless otherwise specified.

B. Provide 1-1/2 pair butts per door for doors up to 7'-6" in height. Doors over 7'-6" in height shall have two (2) pairs of butts.

C. Butt size requirements:
   1. Interior doors up to 37" wide 4-1/2 x 4-1/2.
   2. Interior doors over 37" wide 5 x 4-1/2.
   3. Exterior doors 5 x 4-1/2.

D. Door butt legend: (unless otherwise noted in Schedule)
   1. Exterior doors B1199 - NRP.
   2. Interior doors B1179 - TBB.

E. Furnish U.L. approved butts on labeled doors.

F. Spring Hinges: As manufactured by Hager, U.L. approved butts on labeled doors. Coordinate hinge requirements with door size and weight.

G. Continuous gear hinges to be Select Hinge.

H. Pivots shall be Glynn-Johnson as specified.

2.04 DOOR CLOSERS

A. Shall be LCN of proper size as described in manufacturer's schedule of sizes.

B. Where parallel arm or weather strip is specified, closers shall be one size larger than manufacturer's recommendations.

C. Closers shall have key adjusting device. Furnish six adjusting keys.

D. Mount to provide maximum opening permitted by building construction or equipment, and note on this schedule this maximum swing per location for other trades involved in reinforcement or installation.

E. Closers shall be of cast iron, of full rack and pinion construction, including two speed closing adjustment, adjustable hydraulic back-check and fully adjustable spring power plus reversible shoe feature, of type listed in schedule. Closer fluid shall be "all weather" type not subject to normal temperature changes.

F. All door closers shall be similar in design and appearance to those listed in the schedule, so far as possible, and shall be of one manufacturer. Furnish special arms and applications as indicated in hardware schedule or as dictated by structural conditions or local code requirements.

G. Door closers at labeled fire doors shall bear U.L. approval. Provide thru-bolts for mineral core doors.

H. Door closers finish to match finish hardware i.e. 626 or 606 finishes.

I. Where more than one door occurs in an opening, equip each door with closer, unless otherwise noted.

2.05 PUSH AND PULL HARDWARE, KICKPLATES

A. Shall be as manufactured by Rockwood Manufacturing Company

B. All plates shall be 16-gauge (.050) with beveled sides and countersunk screw holes at intervals of not over 6" on all four sides. Screws shall be stainless steel oval head, finish to match plates. Size of kick, armor, and mop plates as noted.

C. Legend:
   1. Push plate 30S 3x12
   2. Pull Bar 9G 8" (with push plate 30S 3x12)

3. Stainless Steel Kickplate on push side of door 16ga. 33"x12"

2.06 MISCELLANEOUS HARDWARE

A. Thresholds: Reese (Cope around mullions)
   1. S205A

B. Weatherstrips: Reese
   1. Door head & Jambs - Polyurethane 778C
   2. Door sill – Nylon brush 967C

C. Latch Protectors: Don-Jo
   1. LP-107

D. Manual Flush Bolts: Ives
   1. FB457
   2. Standard rod length – 12"
   3. Provide dust proof strike

E. Astragals: Reese
   1. 183SP

F. Flush Pulls: Trimco
   1. 1068-38

G. Door Silencers: Rockwood Manufacturing Company
   1. No. 608

H. Wall and Floor Stops: Rockwood Manufacturing Company
   1. Wall: No.409
   2. Floor: No. 440

I. Hinge Stops: Rockwood Manufacturing Company
   1. Heavy Duty Hinge Pin Stop #528
      a. (2) per door

2.07 OVERHEAD DOOR WEATHERSEALS

A. Where called for on the door schedule provide the following:
   1. Door Bottom – flexible U-shaped vinyl seal encased in extruded aluminum
   2. Door Jamb – EPDM rubber blade angle mounting with rigid vinyl snap-on extrusion
   3. Door Head – EPDM rubber sealing strip

2.08 FINISHES

A. Materials shall be the following. Provide with the finish designated in parenthesis ( ).
   1. Knobs, locks, and latches: Satin chrome (US26D).
   2. Dead locks: To Match Locksets
   3. Exit devices: As indicted in hardware Groups
   4. Push, pulls: As indicated in Hardware Groups
   5. Kickplates: As indicated in Hardware Groups
   6. Door closers: To Match Locksets
   7. Door butts: nonferrous for exterior and wet areas. Ferrous for other doors.
   8. Door stops and holders - Satin chrome (US26D).
   9. Miscellaneous items: As indicated
   10. Note: Verify all finishes with architect prior to ordering hardware.

2.09 KEYING

A. Cylinders and keying shall be by Owner.

2.10 TOOLS AND MANUALS

A. Deliver to the Owner one set of maintenance manuals for locksets, latch-sets, closers, and panic devices.

2.11 HARDWARE GROUPS

Hardware Set No. 1

1 Classroom Lockset
1½ Pr. Hinges
3 Silencers
1 Closer with No Hold Open (122A, 127A, 128B only)
1 Closer with Hold Open (128A only)
1 Kickplate (At doors with Closers only)
1 Wall Stop (All doors except 116A, 122A, and 128A)
2 Flush Mounted Bolts (Top and Bottom of Inactive Leaf)
1 Astragal (128A only)
1 Weatherstrips 778C & 967C (126B, 127A, 128A only)
1 Hinge Stop (116A only)

Hardware Set No. 2

1 Exit Lockset
1½ Pr. Hinges
3 Silencers
1 Closer with No Hold Open
1 Kickplate
1 Weatherstrips 778C & 967C
1 Threshold
1 Latch Protector

Hardware Set No. 3

1 Exit/Blank Lockset (Active Leaf)
1 Blank Plates – Outside & Inside (Inactive Leaf)
1½ Pr. Hinges
3 Silencers
1 Weatherstrips 778C & 967C
1 Threshold (125B only)
1 Astragal
2 Flush Mounted Bolts (Top and Bottom of Inactive Leaf)
1 Floor Stop (127B only)

Hardware Set No. 4

1 Office/Entrance
1½ Pr. Hinges
3 Silencers
1 Closer with No Hold Open
1 Kickplate
1 Floor Stop

Hardware Set No. 5

1 Flush Pulls
1 Mortise Lockset
1 Pr. Hinges (1½ Pr. Hinges 122B only)
2 Silencers (3 for 122B only)
1 Closer with No Hold Open (122B only)
1 Kickplate (122B only)
1 Flush Mounted Bolts (Bottom of Inactive Leaf) (122C, D, and E only)
1 Wall Stop (123 only)

Hardware Set No. 6

1 Panic Hardware
1½ Pr. Hinges
3 Silencers
1 Closer with Hold Open
1 Kickplate
1 Wall Stop
1 Floor Stop (115B only)

Hardware Set No. 7

1 Push/Pull
1½ Pr. Hinges
3 Silencers
1 Closer with No Hold Open
1 Kickplate
1 Floor Stop

Hardware Set No. 8 Exit Doors (Aluminum)

Hardware to be provided by Aluminum Door Supplier as indicated in Section 08 11 16 Aluminum Doors, Frames and Windows.

PART 3 - EXECUTION

3.01 DELIVERIES

A. Stockpile all items sufficiently in advance to ensure their availability, and make all necessary deliveries in a timely manner to ensure orderly progress of the total work.

B. All hardware shall be delivered to a destination as directed by the General Contractor with sufficient time in advance for proper inspection in order not to delay the scheduled completion date.

C. The Owner/General Contractor shall provide a lockable room with ample shelving for the storage of hardware. Upon receipt of the hardware, the Finish Hardware supplier shall unpack and place on the shelves all hardware in order of item and/or door numbers.

3.02 INSTALLATION

A. Install the materials in strict accordance with the manufacturer's recommendations and schedules.

B. Anchor all screws with Loc-Tite to assure permanence of attachment.

C. All doors and hardware to be left in proper working order and cleaned.

3.03 FINAL INSPECTION

A. The Finish Hardware supplier shall inspect the installation of all hardware furnished and shall report any installation adjustments as are necessary to have all hardware in perfect working order.

B. The Finish Hardware supplier shall verify the keying with the Owner to insure proper location of lock-sets and cylinders and shall assist the owner in correcting faulty operation of any lock or other items called to his attention. He shall have all closers checked and adjusted for closing, latching and back check by the Manufacturer's representative.

C. Prior to final acceptance of the building, the Finish Hardware supplier shall make a final

inspection of all hardware furnished to verify that all adjustments and corrections have been made and that all hardware items are in good working order.

3.04 WARRANTY

A. Provide a written warranty in approved form in compliance with the related requirements of the General Conditions, covering all Finish Hardware furnished under this Section against defects in manufacturing and workmanship for a period of one (1) year from the final acceptance of the building.

B. Any material failing to comply with the above guarantee shall be removed and replaced with satisfactory material at the Finish Hardware supplier's expense, including the necessary labor for removing and replacing.

C. During the Warranty Period, the Finish Hardware supplier shall, upon request, make prompt adjustments, repairs or replacements as required to any hardware installed under this contract, other than normal maintenance service.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all glass and glazing accessories as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. General Glass Standard: FS DD-G-451; type, class, quality, style, kind and form are specified in reference to this standard.

B. Qualification of Manufacturer:

1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

C. Qualification of Installers:

1. Use 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.

1.04 SUBMITTALS

A. General:

1. Comply with provisions of Section 01 33 00.

B. Manufacturer's Data:

1. Within 15 calendar days after Award of Contract, submit:
   a. Complete materials list of all items proposed to be furnished and installed under this Section;

b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;

c. Shop drawings for each type of glass unit;

d. Samples for each type and color of glass unit.

C. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.

a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.06 SAFETY GLAZING REQUIREMENT

A. All glass and glazing must comply fully with safety glazing requirements of U.S. Consumers Product Safety Commission Safety Standard for Architectural Glazing Materials. Should there be conflict(s) between this specification and government standards, the latter shall govern.

PART 2 - PRODUCTS

2.01 GLASS MATERIALS

A. Interior Tempered Glass: Clear Type I, Class I, tempered to 4 x normal strength, 1/4" thick.

B. Mirror Clips: J-shaped fasteners approximately 1" in length, chrome plated brass.

2.02 GLAZING MATERIALS (For Installing Glass)

A. Acrylic Sealant: FS TT-S00230, Class B, Type II, solvent based, solids 95% acrylic, compounded specifically for glazing.

B. Acrylic-Latex Sealant: Emulsion-type polymer, permanently flexible, non-staining, non-bleeding.

C. Channel Glazing Compound: Oleo-Resinous, non-oxidizing, non-hardening, soft consistency.

D. Face Glazing Compound: FS TT-G-410.

E. Neoprene Glazing Gasket: ASTM D 2000, Type/Class BC-415 to -620.

F. Closed-cell Neoprene Glazing Gasket: ASTM C 509, Grade 4, self-skinned.

G. Glazing Tape: Tremco 440.

H. Setting Blocks: Neoprene, 70-90 Shore A hardness.

I. Spacers: Neoprene, 40-50 Shore A hardness.

J. Filler-Rod: Non-absorptive, closed cell plastic or rubber which is compatible with other glazing materials in the channel, 3 to 5 psi compression for 25% deflection.

2.03 OTHER MATERIALS

A. All other material not specifically described but required for a complete and proper installation of the work of this Section shall be as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to the approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

B. Check that glazing channels are free of burrs, irregularities and debris.

C. Check that glass is free of edge damage or face imperfections.

3.02 PREPARATION

A. Field Measurements:

1. Measure size of frame to receive glass.
2. Compute actual glass size, allowing for edge clearances.

B. Preparation of Surfaces:

1. Remove protective coatings from surfaces to be glazed.
2. Clean glass and glazing surfaces, to remove dust, oil and contaminants, and wipe dry.

3.03 INSTALLATION

A. Install glass in locations as shown on the Drawings, and in accordance with the manufacturer's instructions.

B. Perform glazing when ambient temperature is above 40`F.

C. Perform glazing on dry surfaces only.

3.04 CLEANING

A. Remove excess glazing compound from installed glass.

B. Labels shall remain intact until final cleaning and acceptance, unless otherwise recommended by manufacturer.

C. Wash and polish both faces of glass.

D. Remove debris from work site.

3.05 PROTECTION OF COMPLETED WORK

A. Attach crossed streamers away from glass face.

B. Do not apply markers to glass surface.

C. Replace damaged glass.

3.06 FINAL INSPECTION

A. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

END OF SECTION

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all gypsum drywall systems and accessories, complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related Work Described Elsewhere:

1. Division 6 Section – Rough Carpentry
2. Division 9 Section – Painting
3. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
4. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit EQ 4.1 and EQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified in this Section.

B. Qualifications of Manufacturer:

1. Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.

C. Qualifications of Installers:

1. Use adequate numbers 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.

1.04 SUBMITTALS

A. General: Comply with provisions of Section 01 33 00.

B. Manufacturers Data:
   1. Within 15 calendar days after Award of the Contract, submit:
      a. Complete materials list of all items proposed to be furnished and installed under this Section.
      b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.

C. Manufacturer's Recommended Installation Procedures:
   1. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

D. LEED Submittals:
   1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
      a. Indicate quantity each of post-industrial or post-consumer recycled content.
      b. Include statement indicating costs for each product having recycled content.
   2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
   3. Credit EQ 4.1 and EQ 4.2: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 PRODUCT HANDLING

A. Protection:
   1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
   2. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer, and at no additional cost to the Owner.

B. Delivery and Storage:
   1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.
   2. Store in accordance with the manufacturers recommendations approved by the Architect.
   3. Store materials inside under cover, stack flat, off floor.
   4. Stack wallboard so that long lengths are not over short lengths.
   5. Store adhesives in dry area, provide protection against freezing at all times.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Regular Gypsum Wallboard:
   1. General: Unless otherwise indicated, gypsum wallboard shall be similar to USG Corp. products, taper-edges, and of the grade and form specified below. Supply the gypsum wallboard in 48" widths and in such lengths as will result in a minimum of joints.
   2. 5/8" thick regular board and moisture-resistant board as shown on the Drawings.
   3. Sheetrock Firecode Gypsum Panels: (For use in walls labeled 1-hour fire-rated construction.)
      a. Fire retardant wallboard shall be similar to USG Corp. Fire Code Gypsum panel 5/8" thick. Entire assembly shall have a 1-hour fire rating, and ratings as

outlined in Drawings.

B. Exterior Gypsum Sheathing:
   1. Unless otherwise indicated on the Drawings, exterior gypsum sheathing shall be similar to USG Corp. 1/2" and 5/8" gypsum sheathing. Square edge treatment required.

C. Metal Trim:
   1. Metal trim features for gypsum wallboard shall be similar to USG Corp. products.
   2. Corner beads shall be similar to USG Corp. Dur-A-Bead Reinforcement.
   3. Edge beads shall be similar to USG Corp. 200-A Metal Trim.
   4. USG Control Joint No. 093 for interior applications.

D. Jointing System:
   1. The jointing system shall include reinforcing tape and compound designed as a system to be used together and shall be only as recommended by the manufacturer of the gypsum wallboard used. Jointing compound may be used for finishing if so recommended by the manufacturer.

E. Fastening Devices:
   1. For fastening the gypsum wallboard in place, use flathead screws, shouldered, specially designed for use with power-driven tools, not less than 1" long, with self-tapping threads and self-drilling points.

F. Surface Primer for Texture Finish:
   1. Sheetrock First Coat as manufactured by USG Corp.

G. Texture Finish:
   1. USG Spray Texture Finish: Orange Peel texture

H. Gypsum Wallboard Returns to Windows and Entrance Framing: Trim Tec 1/2" Pull Away #3010 Part No. 5243797.

I. Gypsum wallboard sills at aluminum windows shall have: Trim Tex 5/8" Mud On™ J Bead #1808.

J. Smooth finish in toilet rooms.

2.02 WATER FOR COMPOUND

A. If the approved jointing system required job-addition of water, use only clean and potable water for that purpose.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and operable installation of the work of this Section, shall be new, first quality of their respective kinds, and subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:
   1. Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that gypsum drywall and tile backer can be installed in strict accordance with all pertinent codes and regulations, the manufacturer's recommendations as approved by the Architect/Engineer and the original design.

B. Walls with Gypsum Wallboard:

1. Install the gypsum wallboard to studs at right angles and right angles to the furring of framing members. Make end joints, where required, over furring or framing members.

C. Walls with Tile Backer System:

1. Install the tile backer system to studs at right angles and right angles to the furring of framing members. Make end joints, where required, over furring or framing members.

D. Mechanical Fasteners:

1. Attach single layer of wallboard to steel framing and furring with Type "S" drywall screws.
2. Attach single layer of tile backer system to steel framing and furring with corrosion-resistant Type 'W' drywall screws.
3. Minimum edge clearance from mechanical fasteners: 3/8"
4. Stagger mechanical fasteners opposite each other on adjacent ends or edges.
5. Sand abutting ends or edges over support surface.
6. Space screws 12" on-center along supports and ceiling.
7. Space screws 8" on-center along ends and edges and field of wallboard at walls.
8. Drive screws with positive clutch electric screwdriver.

3.02 JOINT TREATMENT

A. General:

1. Inspect all areas to be joint treated, ascertaining that the gypsum wallboard fits snugly against supporting framework.
2. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55° degrees F for 24 hours prior to commencing treatment, for the entire period of treatment, and until joint and finishing compounds have dried.
3. Apply joint treatment and finishing compound by machine or hand trowel.
4. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.

B. Embedding Compound: Apply to gypsum wallboard joints and fastener heads in a thin uniform layer. Spread the compound not less than 3" wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged. When thoroughly dry, sandpaper to eliminate ridges and high points.

C. Finishing Compound: After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to all joints and fastener heads. Feather the finishing compound to not less than 12" wide. When thoroughly dry, sandpaper to obtain uniformly smooth surfaces, taking all necessary care to not scuff the paper surface of the wallboard.

3.03 CORNER TREATMENT

A. Internal Corners: Treat as specified for joints, except that the reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.

B. External Corners:

1. Install a corner bead fitting neatly over the corner and secured with the same type fasteners used for applying the wallboard, spacing the fasteners approximately 6" on centers and driving through the wallboard into the framing or furring member.
2. After the corner piece has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 8" to 10" on each side of the corner.

3.04 OTHER METAL TRIM

A. General: The Drawings do not purport to show all locations and all requirements for metal trim in connection with the work of this Section. Carefully study the Drawings and the installation; provide in place all metal trim normally recommended by the manufacturer of the gypsum wallboard used.

B. Installation: Install the metal trim in strict accordance with the manufacturer's recommended methods of installation, providing not less embedment and finishing than specified above for corner treatment.

3.05 SCHEDULE OF JOINT AND FASTENER TREATMENT

A. Walls (from floor to underside of metal deck):

1. Install walls as specified herein; all gypsum wallboard at elevation two feet higher than the finish ceiling may be only taped and rough mudded.

3.06 PRIMER

A. Prime the gypsum wallboard after all joints and corner treatments have been finished. Primer as specified in Section 09 90 00 Paints and Coatings.

3.07 TILE BACKER SYSTEM TREATMENT

A. Cover joints and angles with glass mesh tape; embed with water-resistant compound; skim coat entire Dens-Shield surface.

3.08 CLEANING UP

A. In addition to the requirements of Division 1 of these Specifications, use all necessary care during execution of this portion of the Work to prevent scattering of gypsum wallboard scraps and dust and to prevent tracking of joint and finishing compound onto floor surfaces. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scraps, debris, and surplus material of this Section.

END OF SECTION

SECTION 09 30 00
HARD TILE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all hard tile floor, and wall tile, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.1 and IEQ 4.3: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified in this Section.

B. Qualification of Manufacturer:

1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

C. Qualifications of Installers:

1. Use 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.

1.04 SUBMITTALS

A. General:

1. Comply with provisions of Section 01 33 00.

B. Manufacturer's Data:

1. Within 15 calendar days after award of Contract, submit:

a. Complete materials list of all items proposed to be furnished and installed under this Section;

b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;

c. Samples for each type and color of ceramic floor and wall tile material.

C. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.

a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

3. Credit IEQ 4.1 and IEQ 4.3: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the owner.

1.06 QUALITY ASSURANCE

A. Comply with the standard installation methods and recommendations of the porcelain tile manufacturer.

B. Follow the recommendations of the Tile Council of America Inc.

PART 2 - PRODUCTS

2.01 ACCEPTABLE TILE MANUFACTURERS

A. Dal-Tile Corp

2.02 HARD TILE

A. General: Standard grade units complying with, TCA A137.1-1976. Use bullnose top units, cove base units, inside corners, and outside corners in areas where wall tile is scheduled.

B. Floor Tile: Design is based on nominal 2" x 2" porcelain tile, model , Keystones as manufactured by Dal-Tile Corp.

C. Base Tile: Design is based on porcelain tile, model Keystone, as manufactured by Dal-Tile Corp. Sizes shall be as shown on the drawings. Base shall be built-up base type.

D. Wall Tile: Design is based on nominal 2" x 2" porcelain tile, model , Keystones as manufactured by Dal-Tile Corp.

E. Colors shall be:

1. Color #1 – Urban Putty Speckle D201
2. Color #2 – Elemental Tan D166
3. Color #3 – Artisan Brown D144

F. Patterns shall be as shown on the Drawings.

G. Setting materials to be thinset method.

H. Provide 1% extra stock in clean marked cartons for Owner's emergency use.

I. Furnish one additional box of each color of tile samples to the Owner upon substantial completion of the Project for future maintenance by the Owner.

2.03 DRYSET MORTAR

A. Pre-sanded Portland Cement and additives complying with ANSI A118.1-1967 and TCA 763 equal to Laticrete Floor 'N Wall Thin Set Mortar. As manufactured by Laticrete International, Inc.

2.04 LATEX GROUT

A. Commercial Portland Cement type grout with latex additive, no water; Hydroment or C/Cure Grout with latex additive. Laticrete Floor Grout and Joint Filler gauged with Laticrete 1776.

B. Colors shall be in accordance with the color schedule on the drawings.

2.05 OTHER MATERIALS

A. Crack Suppression and Anti-Fracture Membrane: Laticrete Blue 92 Anti-Fracture Membrane; as manufactured by Laticrete International, Inc.

B. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect/Engineer. Seal tile and joints per manufacturer's specifications. Seal all joints and tile per manufacturers recommendations.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to the approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install hard tile in locations as shown on the Drawings, and in accordance with the manufacturer's instructions. Provide all trim and accessories for a complete installation.

B. Ceramic and glazed wall tile shall be installed using thin-setting bed.

C. Comply with ANSI standard installation specifications ANSI A108.1 through A108.7 and the Tile Council of America "Handbook for Ceramic Tile Installation"

3.03 LAY-OUT

A. Layout of walls and floors and all spaces shall be done prior to start of installation. Contact Architect for approval of layout.

B. Align joints of wall tile with those of floor tile.

C. Cut pieces shall be used only at the ends of floors and walls.

D. Build out around wall openings, jambs, and head, with mortar to make tile fit without cut pieces.

3.04 LATEX GROUT

A. Grout in tile joints and above top and base line with specified grout mix. Wipe off, fill in all voids. Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

3.05 CLEANING AND PROTECTION

A. Remove excess setting materials or other surface blemishes from tile, using neutral cleaners recommended by tile manufacturer. Protect installed flooring from damage, until acceptance by Owner, by covering all flooring with heavy duty, non-staining construction paper, masked in place. After completion of the work and just prior to final inspection, thoroughly remove paper and clean tile floors and accessories.

3.06 FINAL INSPECTION

A. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Acoustical treatment required for this work includes, but is not necessarily limited to:
   a. Acoustical panels for suspended ceilings.
   b. Moisture resistant panels for suspended ceiling (Alternate A-2)
   c. Suspension system

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit EQ 4.1 and EQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified listed in this Section.

B. Qualifications of Manufacturers:

1. Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.

C. Qualifications of Installers:

1. Use adequate numbers 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.

1.04 SUBMITTALS

A. General:

1. Comply with the provisions of Section 01 33 00.

B. Product Data:

1. Within 15 days after Award of the Contract, submit:

a. Complete materials list of all items proposed to be furnished and installed under this Section.

b. Manufacturer's specifications and other data required, demonstrating compliance with the specified requirements.

c. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

d. Affidavits verifying that all materials have a Class A flame spread rating according to Federal Specification SS-5-118B.

C. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.

a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

3. Credit IEQ 4.1 and EQ 4.2: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver the materials in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer.

B. Protection:

1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

C. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS

A. Unless otherwise noted, provide 24" x 24" x 5/8" and panels cut to fit as shown on the Drawings. Acceptable manufacturers:

1. Cortega 704 as manufactured by Armstrong Ceilings, all edges shall be angled tegular type.

2. USG Radar ClimaPlus #2220

2.02 MOISTURE RESISTANT PANELS (Alternate A-2)

A. Acceptable manufacturers:

1. Fine Fissured Ceramaguard as manufactured by Armstrong Ceilings. Color shall be white vinyl; stipple pattern in rooms indicated to have moisture resistant ceilings; 24" x 24" x 5/8" and panels cut to fit as shown on the Drawings. Edges shall be angled tegular type.

2. USG Sheetrock Lay-in ClimaPlus is an accepted equivalent.

2.03 SUSPENSION SYSTEM

A. Unless otherwise indicated on the Drawings, provide DONN DX Exposed Grid System as manufactured by DONN –USG Corp. Acceptable systems shall be Armstrong Prelude 15/16" system, or similar systems by Chicago Metallic Corp. Exposed finish shall be low sheen satin white.

B. Aluminum grid colored white shall be furnished and installed in all bathrooms and areas as indicated to be having moisture resistant panels. (Alternate A-2)

2.04 OTHER MATERIALS

A. Retention clips: provide retention clips to retain panels in place where significant air pressure differential can occur between adjacent spaces and as shown on drawings.

B. All other materials not specifically described but required for a complete and proper installation of the work of this Section, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 ENVIRONMENTAL REQUIREMENTS

A. Complete installation of dampening materials before beginning work.

B. Maintain humidity of 65% to 75% in area where acoustical materials are to be installed, 25 hours before, during and 25 hours after installation.

C. Maintain a uniform temperature in the range of 55° F to 70° F prior to and during installation of materials.

3.03 INSTALLATION

A. Install the materials in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer anchoring all components firmly into position for long life under hard use.

B. Suspension Systems: Conform to requirements of ASTM C 636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1. Hangers:
   a. Hanger clips: Installed as recommended by manufacturer.
   b. Provide stainless steel wiring in areas requiring a moisture-resistant ceiling panel.
   c. Space hanger wire 4 feet on-center, each direction.
   d. Install additional hangers at ends of each suspension member and at light fixtures, 6" from vertical surfaces.
   e. Do not splay wires more than 5" in a 4' vertical drop.
   f. Wrap wires a minimum of three times horizontally, turning ends upward.
2. Saddle tie-carrying channels to main structure for indirect hung suspension system.
3. Main and cross runners:
   a. Space main runners at 2 feet on-center, at right angles to carrying channels.
      i. Level and square to adjacent walls.
      ii. Wire clip to channels at all intersections.
   b. Space cross runners at 2 feet on-center as required for a complete and proper installation.
4. Wall Molding:

a. Install wall molding at intersection of suspended ceiling and vertical surfaces.
b. Miter corners where wall moldings intersect or install corner caps.
c. Attach to vertical surface with mechanical fasteners.

C. Acoustical Units:
1. Install in level plane in straight-line courses.
2. Place materials to bear all around on suspension members.
3. Minimum width of border tiles: One-half unit dimension.

D. Coordination:
1. Carefully coordinate and fit units and suspension system to grilles, diffusers, lighting fixtures, and other related items of Work. In determining spacing and locations of hangers, and where primary runner channels are required, take into consideration the weight of the grilles, fixtures, etc. that are to be installed in conjunction with acoustical ceilings.

E. Edge Treatment:
1. When units must be cut to fit, cut the edge to match the factory board edge.
2. All cuts shall be smooth and straight. The cuts shall resemble factory square cuts.
3. Remove all burrs and strands. Any panels with cuts that are not straight and uniform shall be removed and replaced with a new panel with straight and smooth cuts.

3.04 TOLERANCES

A. Deflection:
1. Suspension system components, hangers, and fastening devices supporting light fixtures ceiling grilles and acoustical units: maximum deflection 1/360 of the span.
2. Deflection test: As per ASTM C 635: Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings..

B. Allowable tolerance of finished acoustical ceiling system:
1. Level within 1/8" in 12'.

3.05 CLEANING

A. Clean soiled or discolored unit surfaces after installation.
B. Touch-up scratches, abrasions, voids and other defects in painted surfaces.
C. Remove and replace damaged or improperly installed units.

3.06 EXTRA STOCK

A. Furnish to Owner a quantity of full size acoustical panels equal to 2 percent of each panel type for future use. This material shall not be used to replace units damaged in the course of construction.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all resilient flooring, complete in place, as indicated on the Drawings, specified herein, or otherwise needed for a complete and proper installation of the work of this Section.

B. Architect reserves the right to select colors. The patterns shall be as shown on the Drawings.

1.02 QUALITY ASSURANCE

A. Use adequate numbers 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.

1.03 SUBMITTALS

A. General:

1. Comply with pertinent provisions of Section 01 33 00.

B. Manufacturer's Data:

1. Within 15 calendar days after Award of Contract, submit:
   a. Complete materials list of all items proposed to be furnished and installed under this Section.
   b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
   c. Samples of each item, color, and pattern available in the specified products from the proposed manufacturer.

C. Manufacturer's recommended methods of installation.

1. The manufacturer's recommended methods of installation, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation methods used on this work.

1.04 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver materials to the Project site and store in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations.

B. Protection:

1. Use all means necessary to protect materials of this Section; protection shall be as recommended by the manufacturer of the resilient materials used, and as approved by the Architect/Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Colors shall be as selected by the Architect/ Engineer from standard colors selection, up to (4) four colors.

B. Floor pattern shall be as shown on drawings.

C. Adhesives:
   1. For standard application – Johnsonite #925 adhesive for resilient flooring:
      a. Approximate Coverage:
         i. Porous Substrate: 150-175 sq.ft.
         ii. Non-porous substrate: 250-300 sq.ft.
      b. Allow adhesive to become tacky before installation. Roll the floor covering with a 100lb. three-section roller to break down adhesive ridges and expel any entrapped air while adhesive is still wet. Avoid working on newly installed flooring whenever possible.
   2. For special application – Johnsonite #975 two-part polyurethane adhesive:
      a. Approximate Coverage:
         i. Porous Substrate: 225-250 sq.ft.
         ii. Non-porous substrate: 225-250 sq.ft.
      b. Flooring must be installed while adhesive is wet. Roll the floor covering with a 100lb. three-section roller to break down adhesive ridges and expel any entrapped air while adhesive is still wet. Avoid working on newly installed flooring whenever possible.
   3. Installation Manual: Refer to Johnsonite Installation Instruction for complete installation details.

D. Manufacturer: Johnsonite, Inc., 16910 Munn Road, Chagrin Falls, Ohio 44023, (800) 899-8916.
   1. Johnsonite's homogeneous flooring Optima Series
      a. .08" thick
      b. Tiles – 24" x 24"
      c. Tile material meets ASTM F 1700, Class I, Type A performance standards for solid vinyl floor tile.
      d. Static coefficient of friction: ASTM D 2047>0.6
      e. Static Load Limit: ASTM F 970 – 250 psi
      f. Fire performance:
         i. Flooring Radiant Panel: ASTM E648 – Class I
         ii. Smoke Density: ASTM E 662 Less than 450

E. Vinyl base shall be 6" high, 1/8" thick, topset cove, Armstrong or Johnsonite in color as selected by the Architect/Engineer from standard colors of the approved manufacturer. Install in continuous lengths from 50' or 100' rolls.

F. Furnish and install vinyl edge strips at the junction of new floor tile, concrete floors, and carpets.

2.02 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be as recommended by the manufacturer of the resilient materials used, and as approved by the Architect/Engineer.

2.03 SUBSTRATE JOINT FILLER

A. Manufacturer's recommended standard.

PART 3 - EXECUTION

3.01 INSPECTION

A. General:

1. Examine the areas and conditions under which resilient flooring is to be placed. Correct conditions detrimental to the proper and timely completion of this work. Do not proceed until unsatisfactory conditions have been corrected.

B. Surface shall be smooth, level, at the required finish elevation, without more than 1/8" in 10'-0" variation from level or slopes shown.

3.02 PREPARATION

A. Substrates:

1. Prior to start of laying tile units, patch and level floor, broom clean or vacuum all surfaces to be covered and inspect the substrate. Start of laying tile will indicate acceptance of substrate conditions.

B. Concrete Primer:

1. Apply concrete slab primer if recommended by tile manufacturer, prior to application of the adhesive. Apply in compliance with manufacturer's instructions.

3.03 INSTALLATION

A. General:

1. Install tile only after all finishing operations, including painting, and overhead work have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by the manufacturer.
2. Place tile units with adhesive cement in strict compliance with the manufacturer's recommendation. Butt tile units tightly to vertical surfaces, thresholds, nosings and edgings. Scribe as necessary around obstructions and to produce neat joints, laid tight, even, and in straight, parallel lines.
3. Extend tile units into toe spaces, door reveals, and in closets and similar openings.
4. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the substrate. Use chalk or other non-permanent marking device.
5. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 3" at room perimeters.

B. Matching:

1. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile are not acceptable.
2. Tightly cement tile to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.
3. Lay tile in checkerboard pattern with grain in alternate tiles running in opposite directions; linear or colored patterns as selected by Architect.

3.04 CLEANING AND PROTECTION

A. Remove excess adhesive or other surface blemishes from tile, using neutral type cleaners recommended by the tile manufacturer. Protect installed flooring from damage until acceptance by the Owner, by covering all flooring with heavy duty, non-staining construction paper, masked in place.

3.05 FINISHING

A. After completion of this work and just prior to final inspection, thoroughly remove paper and clean tile floors and accessories. Apply wax and buff, with the type of wax, number of coats, and buffing procedures recommended by the tile manufacturer.

3.06 EXTRA STOCK

A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

1. Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, of each type, color, pattern and size installed.
2. Base: Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof, of each type, color and size installed

END OF SECTION

SECTION 09 65 66
FITNESS FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all resilient rubber flooring, complete in place, for **Fitness Training Room 117 only**, specified herein, or otherwise needed for a complete and proper installation of the work of this Section.

1.02 QUALITY ASSURANCE

A. Use adequate numbers 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.

1.03 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit IEQ 4.4: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.04 SUBMITTALS

A. General:

1. Comply with pertinent provisions of Section 01 33 00.

B. Manufacturer's Data:

1. Within 15 calendar days after Award of Contract, submit:
   a. Complete materials list of all items proposed to be furnished and installed under this Section.
   b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
   c. Samples of each item, color, and pattern available in the specified products from the proposed manufacturer.

C. Manufacturer's recommended methods of installation.

1. The manufacturer's recommended methods of installation, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation methods used on the Work.

1.05 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver materials to the Project site and store in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations.

B. Protection:

1. Use all means necessary to protect materials of this Section; protection shall be as recommended by the manufacturer of the resilient materials, and as approved by the Architect/Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Colors and patterns shall be as selected by the Architect/ Engineer from standard colors and patterns available from the approved manufacturer in the specified types.

B. Adhesives shall be a waterproof and stabilized type as recommended by the manufacturer of the approved resilient material. Asphalt emulsions and other non-waterproof types will not be acceptable.

C. Fitness Flooring shall be Elite Fitness Flooring as manufactured by Centaur Floor Sytems, 135 Chapala Street, Santa Barbara, CA 93101, (800) 536-9007 or approved equal.

D. Furnish and install edge pieces at the door transition.

2.02 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be as recommended by the manufacturer of the resilient materials used, and as approved by the Architect/Engineer.

2.03 SUBSTRATE JOINT FILLER

A. Manufacturer's recommended standard.

PART 3 - EXECUTION

3.01 INSPECTION

A. General:

1. Examine the areas and conditions under which resilient flooring is to be placed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Surface shall be smooth, level, at the required finish elevation, without more than 1/8" (10'-0") variation from level or slopes shown.

3.02 PREPARATION

A. Subfloors:

1. Prior to start of laying tile units, patch and level floor, broom clean or vacuum all surfaces to be covered and inspect the substrate. Start of laying tile will indicate acceptance of substrate conditions.

B. Concrete Primer:

1. Apply concrete slab primer if recommended by tile manufacturer, prior to application of the adhesive. Apply in compliance with manufacturer's directions.

3.03 INSTALLATION

A. General:

1. Seaming of joints (heat welding method) as recommended in installation manual. Install flooring only after all finishing operations, including painting, have been

completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by the manufacturer.

2. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the substrate. Use chalk or other non-permanent marking device.

3. Provide court and track markings as indicated on Drawings. All court lines shall be applied using the compounded polyurethane paint as approved by Taraflex. Colors to be selected from the Taraflex color chart.

3.04 CLEANING AND PROTECTION

A. Remove excess adhesive or other surface blemishes from tile, using neutral type cleaners recommended by the tile manufacturer. Protect installed flooring from damage until acceptance by the Owner, by covering all flooring with heavy duty, non-staining construction paper, masked in place.

3.05 FINISHING

A. After completion of the Work and just prior to final inspection, thoroughly remove paper and clean tile floors and accessories. Apply wax and buff, with the type of wax, number of coats, and buffing procedures recommended by the tile manufacturer.

END OF SECTION

SECTION 09 68 00
CARPET

PART 1 - GENREAL

1.01 DESCRIPTION

A. Provide all carpeting and accessories complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit IEQ 4.3: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified herein.

B. Qualifications of Manufacturer:

1. Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.

C. Qualifications of Installers:

1. Use adequate numbers 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.

D. General Standard:

1. "Carpet Specifier's Handbook" by The Carpet and Rug Institute, for definitions of terminology not otherwise defined herein, and for general recommendations and information.

E. Guarantee:

1. Provide a written guarantee to cover the correction of the following defects at no cost to the Owner at any time during the two years immediately following substantial completion.
    a. Opening of Seams.
    b. Wrinkling.

c. Loosening from edgestrips and loosening of edge strips from substrate.

d. Defects in installation.

2. Additionally, provide in same written guarantee for a period of one year against delamination of secondary backing and that there will be more than 10% face yarn loss for a period of five years.

1.04 SUBMITTALS

A. General:

1. Comply with provisions of Section 01 33 00.

B. Product Data:

1. Within 20 calendar days after award of the Contract, submit:

a. Complete materials list of all items proposed to be furnished and installed under this Section.

b. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

c. Shop Drawings showing location of all seams and location and types of all carpet metal and accessories.

d. Samples of the full range of colors and patterns of carpet and of exposed accessories available from the proposed manufacturers in the specified qualities. Submit 6" x 9" samples of each carpet and 6" lengths of exposed edge stripping, and 6" square of separate cushions which will be used on this Project.

e. Manufacturer's recommended installation procedures.

i. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspection and accepting or rejecting actual installation procedures used on the work.

f. Notarized affidavit of fire rating classification.

C. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.

a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit IEQ 4.3: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacement:

1. In the event of damage, immediately make all repairs and replacements needed to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MODULAR CARPET

A. Carpet Tile shall be Lees Modular

1. Carpet #1 – Style: Modern Elements, Color: Autumn Harvest.

a. Areas where carpet is installed over stairs or tiers shall be broadloom.

2. Carpet #2 – Style: Modern Organics, Color: On The Surface
   a. Areas where carpet is installed over stairs or tiers shall be broadloom.

2.02 RUBBER BASE

A. Vinyl base shall be 6" high, 1/8" thick, topset cove, Armstrong or Johnsonite in color as selected by the Architect/Engineer from standard colors of the approved manufacturer. Install in continuous lengths from 50' or 100' rolls. **Four-foot long straight stock pieces are not permitted.**

2.03 ADHESIVE

A. Carpet adhesive must meet the VOC requirements of LEED Credit IEQ 4.1.

2.04 SUBSTRATE JOINT FILLER

A. Carpet manufacturer's recommendations.

2.05 OTHER MATERIALS

A. Other materials as required for a complete installation, including but not limited to, adhesive and vinyl carpet edge.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Cleaning:
   1. Immediately prior to installation of the work of this Section, thoroughly clean all substrata and remove all oil, grease, paint, varnish, hardeners, and other items which would adversely affect the bond of adhesive.

B. Smoothing:
   1. Make all substrata level and free from irregularities. Assure one constant floor height after carpet is installed, grinding high spots and filling low spots as required.

C. Installer shall examine substrates for moisture content and other conditions under which carpeting is to be installed. Notify in writing the Owner's representative of conditions detrimental to proper completion of Work.

D. Fill cracks 1/8" or more, holes and unevenness with latex base floor filler (Ardex K-15, Feather Finish) and grind down high spots. Concrete substrate shall comply with Technical Specification Section 03 30 00.

E. Prime where required.

F. Clear away all debris and scrape up cementitious deposits from surface to receive carpeting; vacuum clean immediately before installation. Check concrete surfaces to ensure no dusting through installed carpet; apply sealer where required to prevent dusting. All surfaces to receive carpet shall be thoroughly clean and dry and in a condition satisfactory to the carpet installer.

G. Sequence other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.03 INSTALLATION

A. Install according to manufacturer's recommendations.

B. Avoid any pile being caught in module joints.

C. Butt joints shall be properly aligned.

D. Regulate pressure on joining modules to avoid causing "peaks" or "buckling".

E. Dye lots will not be mixed within an area, unless authorized by the Owner.

F. Install accurately and firmly with joints properly aligned.

G. Install to prevent shifting and movement in large areas.

H. Modules which are cut or trimmed at floor outlets shall be adhered to the floor.

3.04 CLEANING

A. In addition to the requirements of Section 01 71 00, thoroughly clean all carpet surfaces prior to final acceptance of the carpeted areas by the owner.

B. Remove debris, sorting pieces to be saved from scrapes to be disposed of. Replace carpet where spots cannot be removed.

C. Remove all loose threads, pieces of face yarn with sharp scissors.

D. Clean all building surfaces soiled as a result of installing carpet and accessories specified under this Section.

E. Advise Owner of protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

F. All installation of minimum of 24 hours to set before subjecting it to any traffic, moving of furniture, or other heavy equipment. Check for raised seams and corners.

G. Maintenance Materials: Deliver specified overrun and usable scraps of carpet to Owner's designated storage space, properly packaged (paper wrapped) and identified. Usable scraps are defined to include roll ends of less than 9' – 0" length, and pieces of more than 3 square feet area and more than 8 feet wide. Dispose of smaller pieces as "Construction waste".

H. Submit to the Owner, two copies of a complete manual of the manufacturer's maintenance recommendations for each carpet installed in this Project.

3.05 REPLACEMENT STOCK/CARPET TILE AND CUSTOM QUALITIES

A. Prior to final payment, deliver to the Owner a stock of replacement material packages and marked for identification. The quantities should be greater of one box or 2% of total amount of each color and pattern installed.

3.06 PROTECTION

A. Provide a heavy –non-staining paper or plastic walkway as required over carpeting in direction of foot traffic, maintaining intact until carpeted space is accepted by the Owner.

END OF SECTION

SECTION 09 72 16
VINYL WALL COVERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This work is part of Alternate A-1:

1. Work Included: Provide all vinyl wall covering complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

1.02 QUALITY ASSURANCE

A. Standards: Comply with standards specified in this Section.

B. Qualification of Manufacturer: Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

C. Qualifications of Installers: Use 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.

1.03 SUBMITTALS

A. General:

1. Comply with provisions of Section 01 33 00.

B. Manufacturer's Data: Within 45 calendar days after Award of Contract, submit:

1. Complete materials list of all items proposed to be furnished and installed under this Section;
2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
3. Samples for each type and color of vinyl wall covering to be used.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturer: MDC Wallcoverings

1. Style – In Demand Too (54" Value Program), Page 21 – MIT2121, Type I, Reverse Random match

2.02 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of the Section shall be as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work to approval of

the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install vinyl wall coverings in locations as shown on the Drawings, and in accordance with the manufacturer's instructions. Provide all accessories for a complete installation.

3.03 FINAL INSPECTION

A. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

END OF SECTION

SECTION 09 77 00
FIBER REINFORCED PANELS

PART 1 - GENERAL

1.01 1.1 SUMMARY

A. Fiberglass reinforced plastic (FRP) paneling for wall surfaces, including trim accessories.

B. Related Sections: Section(s) related to this section include:

1. Section 06 10 00 Rough Carpentry
2. Section 09 29 00 Gypsum Board

1.02 REFERENCES

A. General: Standards listed by reference form a part of this specification section. Standards listed are identified by issuing authority, abbreviation, designation number, title or other designation. Standards subsequently referenced in this Section are referred to by issuing authority abbreviation and standard designation.

B. ASTM International:

1. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
2. ASTM D5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
3. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. Crane Composites (Inspired by Kemlite):

1. Installation Guide For FRP Panels #6876.

1.03 ADMINISTRATIVE REQUIREMENTS

A. A. Preinstallation Meetings: Conduct preinstallation meeting to clarify Project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.04 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit EQ 4.1 and EQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.05 SUBMITTALS

A. Product Technical Data: For each type of product required.

B. Product Certificates and Laboratory Test Reports: For LEED Credit IEQ 4.1, for adhesives, sealants and wall panels, including a printed statement of VOC content.

C. Shop Drawings: Showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.

D. Samples: Selection and verification samples for finishes, colors and textures. Submit two samples of each type of panel no smaller than 8" x 8", trim and fastener.

E. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.

F. Test and Evaluation Reports: Showing compliance with specified performance characteristics and physical properties.

G. Manufacturer's Instructions: Manufacturer's Installation Guide for FRP #6876.

H. Qualifications Statements: For manufacturer and installer.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For installed products including maintenance methods and precautions against cleaning materials and methods detrimental to finishes and performance.

B. Warranty: Warranty documents required in this section.

1.07 MAINTENANCE MATERIAL

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with 01 77 00 Closeout Procedures.

1.08 PRODUCT HANDLING

A. Protection:
   1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
   2. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer, and at no additional cost to the Owner.

B. Delivery and Storage:
   1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.
   2. Store in accordance with the manufacturers recommendations approved by the Architect.
   3. Store materials inside under cover, stack flat, off floor.
   4. Stack wallboard so that long lengths are not over short lengths.
   5. Store adhesives in dry area, provide protection against freezing at all times.

1.09 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Provider of advanced installer training.

B. Installer Qualifications:
   1. At least five years experience in the installation of fiberglass reinforced plastic panels.
   2. Experience on at least five projects of similar size, type and complexity as this Project.
   3. Employer of workers for this Project who are competent in techniques required by manufacturer for installation indicated.

C. Surface-Burning Characteristics: Determined by testing identical products according to ASTM E84 by a testing agency acceptable to authorities having jurisdiction.
   1. Flame-Spread Index: 200 (Class C).

1.10 PROJECT CONDITIONS

A. Ambient Conditions:

1. Do not begin installation until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete or terrazzo work has dissipated.
2. During installation, and within 48 hours prior to installation, maintain ambient temperature and relative humidity within limits required by type of panel adhesive used and recommendation of panel adhesive manufacturer.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace FRP panels that fail within specified warranty period.

1. Failures shall include, but not be limited to substantial defects in material and workmanship, rotting, rusting, corrosion, development of structural surface cracks, or requiring painting or refinishing.
2. Warranty Period: Ten years from date of Substantial Completion.

B. Special Warranty: Installer's standard form in which installer agrees to repair or replace FRP panels that fail due to poor workmanship or faulty installation within the specified warranty period.

PART 2 - PRODUCTS

2.01 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

A. General: Fiberglass reinforced plastic panels complying with ASTM D5319.

B. Basis of Design Product: Subject to compliance with requirements provide Crane Composites, Inc.; Glasbord Fiberglass Reinforced Plastic (FRP) Panels, Glasbord-P (PIF).

C. Product Options:

1. Color: As selected by Architect from manufacturer's full range.
2. Surface Finish: Pebbled embossed texture.
3. Nominal Thickness: 0.12 inch
4. Surface Protection: Manufacturer's proprietary molecularly-bonded surface protection film for fiberglass reinforced plastic (FRP) panels.

D. Performance Criteria:

1. Scratch Resistance: ASTM D2583, Barcol Hardness of 35
2. Abrasion Resistance: Taber Abrasion Test using CS-17 abrasive wheels with 1000 g weight. Panels shall exhibit weight loss after 25 cycles of no more than 0.038 percent.
3. Impact Strength: ASTM D5420, 30 in-lb (3.4 J) showing no visible damage on finish side.
4. Product Identification: Finish side identification and confirmation of meeting Class C interior finish requirements after installation and while in service, without labels.

2.02 ACCESSORIES

A. Moldings, Trim and Caps: One-piece extruded polypropylene or PVC, configured to cover panel edges and corners.

1. Color: As selected by Architect from manufacturer's full product range.

B. Panel Adhesive: As recommended by panel manufacturer for the required substrates.

1. Adhesive shall have a VOC content of 50 g/L or less.

C. Panel Sealant: As recommended by panel manufacturer.

1. Sealant shall have a VOC content of 250 g/L or less.

2.03 SOURCE QUALITY CONTROL

A. Obtain fiberglass reinforced panels, moldings and other accessories from a single manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. General: Comply with manufacturer's product data, including product technical bulletins, and installation instructions in product catalogs and product packaging.

B. Verify that substrates previously installed under other sections are acceptable for product installation in accordance with FRP manufacturer's instructions.

1. Examine substrate surfaces to determine that corners are plumb and straight, that surfaces are smooth, sound and uniform, that nails or screw fasteners are countersunk, and that joints and cracks are filled flush and smooth with adjoining surfaces.
2. Do not begin panel installation until substrate surfaces are in satisfactory condition.

3.02 PREPARATION

A. Clean substrates to remove substances that could impair bond of adhesive, including oil, grease, dirt, dust or other contamination.

B. Condition panels by unpacking and placing in installation space no less than 24 hours before installation.

C. Lay out paneling before beginning installation. Locate panel joints to provide equal panel widths at ends of walls and so that trimmed panels at corners are not less than 12" wide.

3.03 INSTALLATION

A. General: Comply with panel manufacturer's Installation Guide #6876.

B. Cut and drill panels with carbide tipped saw blades or drill bits, or cut with snips.

C. Install panels with manufacturer's recommended gap for panel field and corner joints.

1. Pre-drill fastener holes in panels, 1/8 inch (3.2 mm) greater in diameter than fastener.
2. Install panels in a full spread of adhesive. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.

D. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.

E. Sealant:

1. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
2. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths.

3.04 CLEANING

A. Remove temporary coverings and protection of adjacent work areas.

B. Repair or replace any installed products that have been damaged.

C. Clean installed panels in accordance with manufacturer's instructions prior to Owner's acceptance.

D. Remove and lawfully dispose of construction debris from project site.

3.05 PROTECTION

A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 09 90 00
PAINTS AND COATINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. All exterior and interior exposed surfaces listed on the Painting Schedule in Part Three of this Section, in accordance with the types of finish specified herein and as shown on the Drawings.

B. Related Sections include the following:

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
3. Credit IEQ 4.2: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

B. Related Work Described Elsewhere:

1. Priming or priming and finishing of certain surfaces are specified to be factory performed or installer performed under pertinent other Sections.

C. Work Not Included in This Section:

1. Do not include painting which is specified under other Sections.
2. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces, and duct shafts.
3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as may be specified herein.
4. Do not paint any moving parts of operating units; mechanical or electrical parts such as valve operators, linkages, sinkages, sensing devices, and motor shafts, unless otherwise indicated.
5. Do not paint over any required labels or equipment identification, performance rating, name, or nomenclature plates.

D. Definitions:

1. The term "paint", as used herein, means all coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers and other applied materials whether used as prime, intermediate or finish coats.

1.03 QUALITY ASSURANCE

A. Standards:
   1. Comply with standards specified in this Section and as listed in Section 01 42 00.

B. Qualification of Manufacturer:
   1. Product used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.

C. Qualification of Workmen:
   1. Provide at least one person who shall be present at all times during execution of the work of this Section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this Section.

D. Paint Coordination:
   1. Provide finish coats which are compatible with the prime coats used.
   2. Review other Sections of these Specifications as required, verifying the prime coats to be used and ensuring compatibility of the total coating system for the various substrata.
   3. Provide barrier coats over incompatible primers, or remove the primer and reprime as required.

1.04 SUBMITTALS

A. General:
   1. Comply with provision of Section 01 33 00.

B. Manufacturer's Data:
   1. Within 15 calendar days after award of the Contract, submit:
      a. Complete materials list of all items proposed to be furnished and installed under this Section.
      b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.

C. Samples:
   1. Following the selection of colors and glosses by the Architect/Engineer as described in Paragraph 2.01-D below, submit Samples as requested for the Architect/Engineer review:
   2. Provide two Samples of each color and each gloss for each material on which the finish is specified to be applied.

D. LEED Submittals:
   1. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
   2. Credit IEQ 4.2: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.05 PRODUCT HANDLING

A. Delivery of Materials:
   1. Deliver all materials to the job site in original, new, and unopened containers bearing the manufacturer's name and label showing the following information:
   2. Manufacturers name; type material
   3. Manufacturer's stock number; and batch number
   4. Color-Name & No.

5. Federal Specification Number, if applicable
6. Contents by volume of major pigment & vehicle constituents
7. Application Inst.
8. Thinning/Mix Inst.

1.06 JOB CONDITIONS

A. Surface Temperatures:
   1. Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45°F, unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect/Engineer.

B. Weather Conditions:
   1. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect/Engineer. Applications may be continued during inclement weather within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Design is based on the use of paint products manufactured by Tnemec, Hallman Lindsay, Dupont Industrial Paint, and Sherwin Williams and the materials of the manufacturer are named in the Painting Schedule.

B. Colors and Glosses:
   1. The Architect/Engineer will select colors to be used in the various types of paint specified and will be the sole judge of acceptability of the various glosses obtained from materials proposed to be used by the Contractor.

C. Undercoats and Thinners:
   1. Provide undercoat paint produced by the same manufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

D. Standards:
   1. Provide paint materials which meet or exceed the standards listed for each application in the Painting Schedules in Part 3 of this Section.

2.02 APPLICATION EQUIPMENT

A. General:
   1. For application of the approved paint, use only such equipment as is recommended for application of the particular paint the manufacturer of the particular paint, and as approved by the Architect/Engineer.

B. Other Materials:
   1. All other materials, not specifically described, but required for a complete and proper installation of the work of this Section, shall be new, first-quality of their respective kinds, and as selected by the General Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Discrepancies:

1. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 MATERIALS PREPARATION

A. General:

1. Mix and prepare painting materials in strict accordance with the manufacturer's recommendations as approved by the Architect/ Engineer.

3.03 SURFACE PREPARATION

A. General:

1. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's recommendations as approved by the Architect/Engineer.
2. Remove all removable items which are in place and are not scheduled to receive paint finish, or provide surface applied protection prior to surface preparation and painting operations.
3. Following completion of painting in each space or area, reinstall the removed items by using workmen skilled in the necessary trades.

B. Preparation of Wood Surfaces:

1. Clean all wood surfaces until they are free from dirt, oil, and all other foreign substances.
2. Smooth all finished wood surfaces exposed to view, using the proper sandpaper and spackle compound. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.
3. Unless specifically approved by the Architect/Engineer, do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture-meter approved by the Architect/Engineer.

C. Preparation of Metal Surfaces:

1. Thoroughly clean all surfaces until they are completely free from dirt, oil, and grease.
2. On galvanized surfaces, use solvent for the initial cleaning and then treat the surface thoroughly with phosphoric acid etch. Remove all etching solution before proceeding.
3. Allow to dry thoroughly before application of paint.
4. Aluminum Conduit: Interior, Non-Immersion Surface Preparation: SSPC-SP1 Solvent Cleaning and dry.
5. Exterior Metal, ferrous: Surface Preparation: SSPC-SP6 Commercial Grade Blast Cleaning Field
6. Interior Metal, ferrous: Surface Preparation: SSPC-SP3 Power Tooled Cleaned & Solvent Wiped Field

D. Preparation of Gypsum Wallboard Surfaces:

1. Preparation of Gypsum wallboard surfaces shall be the responsibility of 09 29 00 Gypsum Board.

E. Preparation of Concrete and Masonry Block Surface to be Painted:

1. Fill cracks and irregularities with Portland Cement grout to provide uniform surface texture.
2. Fill concrete masonry unit surfaces with block filler.
3. Surface shall be cured, clean, and dry.

F. Preparation of Concrete Floor for Lane Markers:

1. Roto-Blast and vacuum 6" wide strips of concrete where paint is to be applied. Clean and dry. Work shall be preformed just prior to substantial completion of the Project.

3.04 PAINT APPLICATION

A. General Requirements:

1. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer. Test with moisture meter.
2. Apply paint, enamel stain, and varnish with suitable brushes, rollers, or spraying equipment.
   a. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved less than 10% allowance for losses.
   b. Keep brushes, rollers, and spraying equipment clean, dry, free from contaminates and suitable for the finish required.
3. Apply stain by brush.
4. Comply with recommendation of product manufacturer for drying time between succeeding coats.
5. Vary slightly the color of successive coats.
6. Sand and dust between each coat to remove defects visible from a distance of 5 feet.
7. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas. Finished metal surfaces shall be free of skips, voids or pinholes in any coat when tested with a low voltage detector.

B. Inspection:

1. Do not apply additional coats until completed coat has been inspected by the Architect/Engineer.
2. Only inspected coats of paint will be considered in determining number of coats applied.
3. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.
4. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
5. Apply primer on all work before glazing.
6. Change colors at door where colors differ between adjoining spaces or rooms and where door frames match wall colors.
7. Refinish whole wall where portion of finish has been damaged or is not acceptable.

C. Painted Work:

1. Back prime all interior trim.
2. Runs on face not permitted.

D. Stained (and natural) Finish:

1. Adjust natural finishes as necessary to obtain identical appearance on veneers and solid stock.

E. Cleaning:

1. Touch-up and restore finish where damaged.
2. Remove spilled, splashed or splattered paint from all surfaces.
3. Do not mar surface finish or item being cleaned.
4. Leave storage space clean and in condition required for equivalent spaces in project.

F. Completed work shall match the approved samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.05 PAINTING SCHEDULE

A. General:
   1. Painting required under this Section is specified herein, colors to be selected by the Owner and Architect during submittal review.

B. Interior Metal, Ferrous
   1. First Coat: S-W ProCryl Universal Primer, B66-310 Series (2.0 – 4.0 mils dry)
   2. Second Coat: S-W Waterbased Catalyzed Epoxy, B70W211/B60V15
   3. Third Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V15

C. Doors, Hollow Metal Door Frames
   1. First Coat: S-W ProCryl Universal Primer, B66-310 Series (2.0 – 4.0 mils dry). (When not factory primed)
   2. Second Coat: S-W ProClassic Waterborne Acrylic High Glass, B21-351 Series.
   3. Second Coat: S-W ProClassic Waterborne Acrylic High Glass, B21-351 Series. (4.0 mils wet, 1.5 mils dry per coat)

D. Interior drywall & plaster:
   1. General:
      a. First Coat: S-W Harmony Low Odor Interior Latex Primer, B111W900 (4.0 mils wet, 1.3 mils dry per coat)
      b. Second Coat: S-W Low Odor Interior Latex Semi-Gloss, B10 Series
      c. Third Coat: S-W Low Odor Interior Latex Semi-Gloss, B10 Series (4.0 mils wet, 1.6 mils dry per coat)

E. Interior Masonry Exposed to View:
   1. Roof / Ceiling System down to finish floor:
      a. First Coat: Sherwin-Williams PrepRite Masonry Primer.
      b. Second and Third Coat: Sherwin-Williams ProMar 200 Alkyd Gloss Enamel.

END OF SECTION

SECTION 10 11 16
MARKERBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Furnish and install all markerboards complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified in this Section.

B. Qualification of Manufacturer:

1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

C. Qualifications of Installers:

1. Use 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.

1.04 SUBMITTALS

A. General:

1. Comply with provisions of Section 01 33 00.

B. Manufacturer's Data:

1. Within 15 calendar days after Award of Contract, submit:
   a. Complete materials list of all items proposed to be furnished and installed under this Section.
   b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
   c. Shop drawings for each type of markerboard unit showing components, arrangements, dimensions, orientation on walls, section of trim members, dimension elevations, grounds, reinforcements, and accessories; and
   d. Samples for each type and color of markerboard unit showing face material, colors, accessories, and trim, unless pre-selected. Provide 30 cm. (12") square sample of sheet materials and 30 cm (12" length of trim materials.)
   e. Affidavit of fire-rating classification.

C. LEED Submittals:

   a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MARKERBOARDS

A. Computer Lab 116:

1. Shall be Claridge LCS2412 4'Hx10'W Markerboard with 2 ½" marker tray

B. Auditorium 115:

1. Shall be Claridge 6'-0" 517-6CH lecture unit
   a. Type of wood and finish shall be: Cherry
   b. LCS inside doors

C. Locations as shown on drawings.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.02 DELIVERY

A. Deliver factory-built unit completely assembled in one piece without joints, whenever possible. When overall dimensions require delivery in separate units, pre-fit at factory, disassemble for delivery, and make final joint at Project site.

3.03 INSTALLATION

A. Install board in location as shown on the Drawings, and in accordance with the manufacturer's instructions. Provide all grounds, brackets, anchors, trim, and accessories for a complete installation.

3.04 FINAL INSPECTION

A. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

END OF SECTION

SECTION 10 14 00
INTERIOR SIGNAGE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:
   1. Provide all interior signs, complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related Sections include the following:
   1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 – LEED requirements". LEED Requirement's that may be impacted include but are not limited to:
   1. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
   2. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Standards:
   1. Comply with standards specified in this Section.

B. Qualifications of Manufacturer:
   1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

1.04 SUBMITTALS

A. General:
   1. Comply with provisions of Section 01 33 00.

B. Manufacturer's Data:
   1. Within fifteen (15) working days after Award of Contract, submit:
      a. Complete materials list of all items proposed to be furnished and installed under this Section;
      b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
      c. Shop drawings for all sign letters and sizes showing components, arrangements, dimensions, orientation on walls, letter style, mountings, finish and accessories.

C. Submit complete shop drawings and erection drawings conforming to the requirements of AISC specifications. Preparation of shop drawings shall not be sublet.
   1. Approved procedures for welding and quality control shall be enforced and supervised.

2. Welders' Qualifications: Minimum six months experience. Certificate required for each welder.

D. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Equal products of other sign manufacturers will be acceptable when approved by the Architect/Engineer in accordance with the General Conditions.

2.02 GENERAL SIGNS

A. Men's and Women's Toilet Room Signs:

1. Provide all door signage, complete, in place, specified herein, and needed for a complete and proper installation.
2. Mounting height shall be in accordance with manufacturer's recommendations, in accordance with Americans with Disabilities Act, and Accessibility Guidelines.
3. All signage plates shall be raised letter type size 6" x 6" with 1/2" radius corners. Character height of 3 inches for the pictogram and 5/8 inch for the lettering. All lettering shall be accompanied by grade 2 Braille.
4. Provide the following signage:
   a. At Women's Door - One per Door
      i. International Symbol (Female) - Symbol Height: 3.5"
      ii. Wheelchair Symbol - Symbol Height: 3.5"
      iii. Colors to be selected by Architect.
   b. At Men's Door - One per Door
      i. International Symbol (Male) - Symbol Height: 3.5"
      ii. Wheelchair Symbol - Symbol Height: 3.5"
      iii. Colors to be selected by Architect.
   c. Tactile "Exit" signs – total of (4) according to 2009 IBC Section 1011.3 "Tactile Exit Signs"
      i. Sign size: 3"H x 4"W w/ ½ radius corners.
      ii. Colors to be selected by Architect.
      iii. Sign shall have 5/8" inch lettering. All lettering shall be accompanied by grade 2 Braille.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to approval of the Architect/Engineer. Do not proceed until satisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install signs in locations specified, above doors, and in accordance with the manufacturer's instructions. Provide all anchors, trim, spacers, and accessories for a complete installation.

3.03 FINAL INSPECTION

A. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

END OF SECTION

SECTION 10 21 13
METAL TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This Section describes all metal toilet partitions, urinal screens, shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related Work Described Elsewhere:

1. Division 10 Section 10 28 13 – Toilet Room Accessories

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 ACCEPTABLE MANUFACTURERS

A. Baked enamel ceiling hung partitions as manufactured Bradley Corp.-Mills Partitions.

B. Color shall be: Toffee 8517

1.04 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified in this Section.

B. Qualifications of Manufacturers:

1. Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.

C. Qualifications of Installers:

1. Use adequate numbers 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.

D. Comply with requirements of the Americans with Disabilities Act, Accessibility Guidelines for Buildings and Facilities.

1.05 SUBMITTALS

A. Product Data:

1. Within 15 calendar days after Award of Contract, submit:
   a. Complete materials list of all items proposed to be furnished and installed under

this Section.

b. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

c. Shop drawings and sufficient dimensional data to enable proper coordination of installation of concealed items of support.

d. Manufacturer's recommended installation procedures.

2. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

B. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for products having recycled content.

a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.06 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect work and materials of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 TOILET PARTITIONS AND URINAL SCREENS (Baked Enamel)

A. Materials:

1. Ceiling mounted toilet enclosures with pilasters extending from the ceiling to the bottom of partition.

2. Style: Flush partitions and doors.

3. Clear space at door openings to barrier-free compartments shall be 32 inches in accordance with the Americans with Disabilities Act, out-swinging, and marked with barrier-free insignia.

4. Urinal screens shall be wall-hung.

B. Panel Construction:

1. Face Plates:

a. Stretcher leveled cold-rolled steel with minimum zinc coating each side of 0.00015": ASTM A 591/A 591M, Class C, mill phosphatized.

b. Minimum face plate thickness:

i. Door: 22 gauge.

ii. Partition and screen: 20 gauge.

iii. Stile or pilaster: 18 gauge.

iv. Door, partition and screen edge locking strips: 20 gauge.

v. Stile or pilaster edge locking strips: 20 gauge.

2. Reinforcement:

a. For tapping: 14 gauge.

b. For anchoring: 12 gauge.

c. Field application of accessories: 4" wide blocking.

3. Sound-deadening Core: Hexagonal honeycomb cells or kraft paper with minimum weight of 25 lbs. per 1000 sq. ft.
4. Minimum Section Thicknesses:
   a. Doors, partitions and screens: 1"; Pilasters and stiles: 1-1/4".
5. Fabrication:
   a. Fabricate straight, clean cut, and free from defects in workmanship, materials and appearance.
   b. Construct doors, panels and pilasters of two face sheets.
      i. Integrally interlock edges or,
      ii. Form edges:
         (a.) Assemble over and cement under pressure to core.
         (b.) Bind formed edges with lock strip.
   c. Miter corners of edge molding; weld and grind smooth.
   d. Provide concealed reinforcement for tapping or rivet nuts where machine screws are required for fastening.

C. Hardware:
1. Furnish non-corrosive fittings, brackets, hardware and fasteners for installation.
2. Hinges: Conceal operable parts in door; gravity rising or non-rising spring tension actuated.
3. Latches: Slide type; mounted within doors, with emergency release by lifting door.
4. Provide corrosion resistant, theft-resistant fasteners for exposed hardware and component connections, including compartments to walls.

D. Accessories:
1. Provide the following accessories in addition to those furnished by manufacturers with standard product:
   a. Coat hook and bumper.

E. Finishes:
1. Exposed ferrous surfaces and hardware incorporated in door before finishing, baked enamel in manufacturer's standard colors as selected by Architect/Engineer.
2. Exposed non-ferrous hardware and fittings, not an integral part of partition door and pilaster: polished, nickel plated, and chromium plated; or aluminum with satin clear anodized finish.

PART 3 - EXECUTION

3.01 FABRICATION

A. Fabricate in strict accordance with the manufacturer's product data as approved by the Architect/Engineer.

3.02 PREPARATION FOR INSTALLATION

A. Coordination:
1. Properly coordinate with all other trades as required to ensure adequate provision for anchorage of the work of this Section and for proper interface with the work of all other trades.

B. Inspection:
1. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Anchor partitions, pilasters, and screens to walls with brackets.

B. Anchor pilasters to structure above with adjustable, leveling type, corrosion resistant ceiling bolt assembly.

C. Install hardware as recommended by manufacturer.

D. Conceal evidence of drilling in walls and in finished work.

E. Adjust pilaster shoes to fit flush with finish ceiling.

3.04 ADJUST AND CLEAN

A. Adjust brackets to provide uniform clearances not exceeding:

1. Pilaster and wall: 1"; Panels and wall: 1".
2. Pilasters and panels: 1/2"; Pilasters and doors: 3/16".

B. Adjust hardware for proper operation.

C. Set hinges to hold doors ajar when not latched.

D. After completion of installation, clean and polish exposed compartment and screen surfaces and touch-up minor scratches.

END OF SECTION

SECTION 10 22 26
OPERABLE PARTITIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General

1. Furnish and install operable partitions and suspension system. Provide all labor, materials, tools, equipment, and services for operable walls in accordance with provisions of Drawings including track, hang rods, mounting brackets, plenum closure, all miscellaneous hardware and appurtenances and all work necessary to attach track to structural components.

1.02 RELATED SECTIONS

1. Division 01 Section "LEED Requirements" for requirements associated with LEED Certification requirements.
2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.03 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13-Leed requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit IEQ 4.1: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.
4. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.04 RELATED WORK BY OTHERS

1. Preparation of opening will be by General Contractor. Any deviation of Project conditions contrary to approved shop drawings must be called to the attention of the Architect.
2. All header, blocking, support structures, jambs, track enclosures, surrounding insulation, and sound baffles as required.

1.05 SUBMITTALS

1. Complete shop drawings are to be provided prior to fabrication indicating construction and installation details. Shop drawings must be submitted within 60 days after receipt of signed Contract.
2. Product Data: Provide manufacturer's written instructions for installation, operation and maintenance.
3. Shop Drawings: Furnish shop drawings showing complete sections, details and dimensions. Shop drawings shall fully detail:
   a. Track and anchorage to overhead structure.
   b. Stack track assemblies with panels in pocket.

c. Panel carriers, locations and operating details.

d. Top and bottom mechanical seals with method of activation and location of operating mechanism.

e. Vertical seals on panels and expandable jamb attached to last panel for final closure.

f. Panel construction showing gauges and thicknesses of all materials.

g. Method of locking lead panel in stack position to prevent unauthorized operation of partitions.

h. Details of inset pass door including latching hardware, compliance with ADA requirements and recessed exit sign.

i. Details of inset dry marker boards and eraser pockets.

j. Pocket door construction including jambs and concealed operating hardware.

k. Plenum closure construction, including access panels for future adjustment.

4. Care and maintenance manual for Owner at completion of Project.

5. Certificate: STC rating for operable partition.

B. LEED Submittals:

1. Credit MR 4: Documentation of recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

3. Credit IEQ 4.1: Documentation for interior low emitting materials adhesives and sealants confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

1.06 QUALITY ASSURANCE

1. Preparation of the opening shall conform to the criteria set forth per ASTM E 557: Standard Guide for the Installation of Operable Partitions.

2. The partition STC (Sound Transmission Classification) shall be achieved per the standard ASTM E 90 test method.

3. Noise isolation classifications shall be achieved per the standard test methods ASTM E 336 and ASTM E 413.

4. Noise Reduction Coefficient (NRC) ratings shall be per ASTM C 423.

5. The manufacturer shall have a quality system that is registered to the ISO 9001 standards.

1.07 CODES AND STANDARDS

A. ASTM American Society for Testing and Materials

B. UL Underwriters Laboratories, Inc.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. This Contractor is responsible for all freight charges, receiving, unloading and moving of materials to Project site. Proper storage of partitions before installation and continued protection during and after installation will be the responsibility of the General Contractor.

B. Factory wrap all panels in heavy plastic prior to crating and hang panels with protective plastic wrap in place. Remove wrapping to complete installation.

C. Use all means necessary to protect the work of this Section until acceptance by Architect.

1.09 WARRANTY

A. Partitions and installation shall be guaranteed under normal usage for a period of two (2) years after substantial completion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Specified manufacturer: HUFCOR, Inc. Janesville, WI.

B. Upon compliance with all of the criteria specified in this Section, manufacturers wishing to bid products similar to the product specified must submit to the Architect at least 21 days prior to bidding, complete data in support of compliance and a list of three past installations of products similar to those listed. The submitting manufacturer guarantees the proposed substituted product complies with the product specified and as detailed on the Drawings.

2.02 MATERIALS

A. Product to be top supported Series 631 individual, omni-directional panels as manufactured by Hufcor, inc.

1. Panels shall be nominally 3" thick. Panel width shall be determined by dividing the length of the partition wall 7 evenly spaced panels.
2. Panel faces shall be laminated to appropriate substrates to meet the STC requirement in 2.04 Acoustical Performance.
   a. Panels shall have 1/8" cork tackable substrate using Revelations Fabric.
3. Frames shall be of 16 gauge painted steel with integral factory applied aluminum vertical edge and face protection.
4. Vertical interlock between panels shall be dual durometer polyvinylchloride in a tongue and groove configuration. Design shall provide minimum 3/4" panel-to-panel interlock. The lead panel shall seal against the adjacent wall without the need for wall mounted jambs.
5. Horizontal top seals shall be retractable, provide 1" nominal operating clearance, and exert upward force when extended. Horizontal top seals shall be continuous contact multi-ply vinyl.
6. Horizontal bottom seals shall be retractable, provide up to 2" nominal operating clearance, and exert downward force when fully extended.
7. Horizontal trim shall be of aluminum.
8. Provide inset dry marker boards where shown on plans. Marker boards to porcelain on steel equal to Alliance Wall in manufacturer's standard colors. Boards to be 4'-0" high x panel width.
9. Provide recessed eraser pockets where shown on plans.
10. Provide inset pass door constructed the same as a basic panel and with the same sound rating. Pass door to provide ADA compliant operation. Provide positive latching hardware. Roller or magnetic latches shall not be acceptable. Provide recessed self-powered exit sign above the pass door, with a minimum 20 year life rating. Provide an aluminum fixed wall jamb at Western most panel to accommodate pass door.
11. Provide one type 4 pocket door where shown on plans. Pocket door panels to be constructed the same as the operable partition panels and have the same finish. All operating hardware to be concealed. No exposed foot or floor bolts will be acceptable.
12.

B. Weight of the panels shall be 5.7 to 10.2 lbs./sq. ft. based on options selected.

C. Suspension system:

1. Track shall be of clear anodized architectural grade extruded aluminum alloy 6063-T6. Track design shall provide precise alignment at the trolley running surfaces and provide integral support for adjoining ceiling, soffit, or plenum sound barrier. Track shall be connected to the structural support by pairs of min. 3/8" diameter threaded steel hanger rods. Pairs of rods are directly attached to the track, no single point

attachment allowed. L, T, or X intersection shall be factory assembled and welded.

a. Each panel shall be supported by two 2-wheeled counter-rotating horizontal carriers. Wheels to be of precision ground steel ball bearings with heat treated and hardened races encased with molded polymer tires.

2. Plenum closure shall be by General Contractor. Design of plenum closure must permit lifting out of header panels to adjust track height.

3. Factory applied fabric shall be factory applied reinforced polyolefin Revelations fabric. Color shall be selected from manufacturer's standard color selector.

D. Finishes:

1. Face finish shall be Revelations Fabric.

a. Color shall be selected from manufacturer's standard color selector.

2. Exposed metal trim and seal color shall be selected from manufacturer's standard trim selector.

3. Aluminum track shall be clear anodized.

2.03 Operation

A. Panels shall be manually moved from the storage area, positioned in the opening, and seals set.

B. Retractable Seals

1. Retractable horizontal seals shall be activated by a removable quick-set operating handle located approximately 42" from the floor in the panel edge. Seal activation requires approximately a 190 degree turn of the removable handle. Top and bottom retractable seals shall be operated simultaneously.

2. Final partition closure to be by Expanding Jamb Closure Panel. Expanding jamb panel construction shall be the same as basic panels but with an expanding jamb. Jamb compensates for minor wall irregularities and provides a minimum of 250 lbs. seal force against the adjacent wall for optimum sound control. The jamb activator shall be located approximately 45" from the floor in the panel face and be accessed from either side of the panel. The jamb shall be equipped with a mechanical rack and pinion gear drive mechanism and shall extend 4" to 6" by turning the removable operating handle.

3. Stack/Store Panels

a. Retract seals with removable operating handle and move to storage area.

2.04 Acoustical Performance

a. Acoustical performance shall be tested at a laboratory accredited by the U.S. Dept. of Commerce, National Institute of Standards and Technology, under the National Voluntary Laboratory Accreditation Program (NVLAP) and in accordance with ASTM E 90 Test Standards. Standard panel construction shall have obtained an STC rating of 52 +/- 1 STC.

b. Complete, unaltered written test report is to be made available upon request.

2.05 PARTITION PLENUM CLOSURE

A. General Contractor shall construct plenum closure from track to bottom of roof deck. Closure shall maintain sound rating of partition. Plenum closure shall be constructed so as to allow for access to track and hangers for future adjustment. Plenum closure shall have total of two (2) (one (1) each side) layers of 5/8" gypsum board on structural framing with sound insulation batts inside.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Installation shall be accomplished only by factory authorized installers.

B. Installation shall be in strict accordance with the manufacturer's printed instructions.

C. Contractor to verify opening is within tolerances before proceeding with the installation. If opening is not within tolerances, have defects corrected.

D. The complete installation of the operable wall system shall be by an authorized factory-trained installer and be in strict accordance with the approved shop drawings and manufacturer's standard printed specifications, instructions, and recommendations.

3.02 WORK BY OTHERS

A. Overhead support for partitions and stack assemblies shall be by General Contractor. All structural steel support shall be pre-drilled for track hanger rods following template supplied by partition manufacturer.

B. Blocking in pocket walls for attachment of pocket door jambs.

C. Floor and overhead support shall be level within 1/4" in 10'- 0", non-cumulative, across the entire length of the partition. Jamb openings must be plumb.

1. If the floor is not within these limits, the General Contractor shall grind smooth and/or fill to meet these requirements.
2. If the jambs are out of plumb, General Contractor shall correct as required.

3.03 CLEANING AND ADJUSTMENT

A. Clean all surfaces.

B. Adjust partition for smooth, free operation and latching.

C. All track and panel surfaces shall be wiped clean and free of handprints, grease, and soil.

D. Cartoning and other installation debris shall be removed from the Project site.

E. Training

1. Installer shall demonstrate proper operation and maintenance procedures to Owner's representative.
2. Operating handle and owners manuals shall be provided to Owner's representative. Manufacturer's representative shall demonstrate for Owner proper operation and care of partitions.
3. Turn over to Owner two (2) operating handles for each type required for each partition.

END OF SECTION

SECTION 10 26 00
WALL AND CORNER GUARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Non PVC wall and corner guard systems for wall protection and decoration

1.02 SECTION INCLUDES

A. 160 Corner Guards

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. National Fire Protection Association (NFPA)

C. Society of Automotive Engineers (SAE)

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide wall guard system that conforms to the following requirements of regulatory agencies and the quality control of InPro Corporation.

1. Fire Performance Characteristics: Provide wall guard conforming with the NFPA Calls A fire rating. Surface burning characteristics, as determined by ASTM E-84, shall be flame spread of 10 and smoke development of 300.
2. Impact Strength: Provide profile materials that have an Impact Strength of 19 ft-lbs/inch of thickness as tested in accordance with the procedures specified in ASTM
3. Chemical and Stain Resistance: Provide Non PVC material that shows resistance to stain when tested in accordance with applicable provisions of ASTM D-543.
4. Fungal and Bacterial Resistance: Provide Non PVC material that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.
5. GREENGUARD Certified: Provide GREENGUARD Certified Non PVC profiles. Non PVC profiles shall meet the requirements of GREENGUARD Certification Standards for Low-Emitting Products and GREENGUARD Product Emission Standard for Children & Schools.
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.

1.05 SUBMITTALS

A. Product Data: Manufacturer's printed product data for each type of wall guard specified.

B. Detail Drawings: Mounting details with the appropriate fasteners for specific project substrates.

C. Samples: Verification samples of wall guard, 8" (203mm) long, in full size profiles of each type and color indicated.

D. Manufacturer's Installation Instruction: Printed installation instructions for each wall guard.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite

B. Inspect materials at delivery to assure that specified products have been received.

C. Store in original packaging in a climate controlled location away from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Requirements: Products must be installed in an interior climate controlled

environment.

1.08 WARRANTY

A. Standard InPro Limited Lifetime Warranty against material and manufacturing defects.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: InPro Corporation, PO Box 406 Muskego, WI 53150 USA; Telephone: 800.222.5556, Fax: 888.715.8407, www.inprocorp.com

B. Substitutions: Not permitted

C. Provide all wall guards and wall protection from a single source.

2.02 LEED Criteria

A. Provide wall guard systems with components that have recycled content.

1. MR Credit 4.1, 10%(post-consumer + ½ pre-consumer), 1 credit
2. MR Credit 4.2, 20%(post-consumer + ½ pre-consumer), 1 credit

2.03 MANUFACTURED UNITS

A. Corner Guard:

1. InPro 160 Surface Mounted 90 degree, 2" wing, 3'-0" High.

2.04 MATERIALS

A. Polycarbonate/acrylonitrile butadiene styrene (PC/ABS): Snap on cover of .080" (2mm) thickness shall be extruded from chemical and stain resistant PC/ABS. Inner snap-on impact bumper of .070" (1.8mm) thickness shall be extruded from chemical and stain resistant PC/ABS.

B. Aluminum: Continuous aluminum retainer of .080" (2mm) thickness shall be fabricated from 6063-T5 aluminum, with a mill finish.

2.05 COMPONENTS

A. End caps, inside corners and outside corners shall be made of injection molded thermoplastics.

B. Fasteners: All mounting system accessories appropriate for substrates indicated on the drawings shall be provided.

2.06 FINISHES

A. Covers: Colors of the wall guard to be selected by the architect from the InPro EnviroGT finish selection. Surface shall have a pebblette texture.

B. Inner Impact Bumper: Color of the inner impact bumper to be black.

C. Molded Components: End caps, inside corners and outside corners shall be of a color matching the wall guards. Surface shall have a pebblette texture.PART 3 - EXECUTION

2.07 EXAMINATION

A. Examine areas and conditions in which the wall guard systems will be installed.

1. Complete all finishing operations, including painting, before beginning installation of wall guard system materials.

B. Wall surface shall be dry and free from dirt, grease and loose paint.

2.08 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

2.09 INSTALLATION

A. General: Locate wall guard as indicated on the approved detail drawing for the appropriate substrate, and in compliance with the InPro installation instructions. Install wall guard level and plumb at the height indicated on the drawings. Installation of the G1800 Wall Guard

1. Cut the aluminum retainer to the desired length, allowing 1-11/16" (43mm) for each end cap, 1-1/2" (38mm) for each inside corners and 5/8" (16mm) for each outside corner.
2. Using a 1/4" drill bit, drill holes along the top and bottom "V-groove" 4" (102mm) from each end and spaced evenly over the entire length (10 anchors per 12' (3.66m) length).
3. Position and level the aluminum retainer on the wall, allowing for end caps and corners, and transfer mounting holes to the wall with a marker. Drill 1/4" (6mm) holes at each mark and position ALLIGATOR anchors into the holes on the wall. Mount the retainer with #10 x 1-3/4" Phillips pan head screws and tighten the screws to secure the retainer.
4. Slide the end caps and corners onto the aluminum, leaving a 1/16" gap for adjustments, and secure with one 1-1/4" self-tapping screw per end cap or two per corner.
5. Cut the cover to the distance between the end caps/corners. NOTE: Trim all factory edges square before installation. Position the cover on the aluminum retainer starting at one end and working to the other end by pushing the cover over the aluminum until it snaps into place.

2.10 CLEANING

A. At completion of the installation, clean surfaces in accordance with the InPro clean-up and maintenance instructions.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Provide all toilet room accessories, complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

1.02 LEED REQUIREMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability to successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section "01 81 13 - LEED requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR 2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.

1.03 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified in this Section.

B. Qualifications of Manufacturer:

1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

1.04 SUBMITTALS

A. General:

1. Comply with provisions of Section 01 33 00.

B. Manufacturer's Data:

1. Within 15 working days after Award of Contract, submit:
   a. Complete materials list of all items proposed to be furnished and installed under this Section;
   b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
   c. Manufacturer's recommended methods of installation.
   d. Complete descriptive data on fasteners proposed for each type of wall construction, recommended mounting locations, and mounting instructions.

C. The manufacturer's recommended methods of installation, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation methods used on this work.

D. LEED Submittals:

1. Credit MR 4: Product Data indicating percentage by weight of recycled content for

products having recycled content.

a. Indicate quantity each of post-industrial or post-consumer recycled content.

b. Include statement indicating costs for each product having recycled content.

2. Credit MR 5: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. Anchors and Fasteners:

1. Provide anchors and fasteners capable of developing a retaining force commensurate with the strength of the accessory to be mounted, and well suited for use with the supporting construction. Where exposed fasteners are permitted, provide oval head theft resistant fasteners with finish matching the accessory.

B. Finish:

1. All accessory items shall be stainless steel with satin finish.

C. Design:

1. Design is based on use of products manufactured by the Bobrick Washroom Equipment, Inc., and catalog numbers of that manufacturer are given as an indication of the quality and style required. Equal products by Bradley Corp., GAMCO- General Accessory Manufacturing Co., ASI- American Specialties, Inc., or other manufacturers approved by the Architect/Engineer will be acceptable in accordance with the General Conditions.

2.02 ACCESSORY ITEMS

A. Furnish and install in each restroom:

1.	24"x36" Framed Mirror	Model	B-165 (2 per bathroom)
2.	Stainless Steel Grab Bars	Model	B-6206 1 x 48 (1 req'd /Barrier-free stall)
3.	Stainless Steel Grab Bars	Model	B-6206 1 x 36 (1 req'd/Barrier-free stall)
4.	Stainless Steel Grab Bars	Model	B-6206 1 x 18 (1 req'd/Barrier-free stall)
5.	Electric Hand Dryer	Model	XL-XB Excel Dryer Inc. Xlerator, 120V / 1P, 12.5A, 60Hz, with recess kit.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Verify spacing of plumbing fixtures and toilet partitions that offset installation of accessories. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Throughout construction of substrate surfaces, use all means necessary to ensure proper

and adequate provision for concealed support devices, and for finished openings, to receive the work of this Section.

3.03 INSTALLATION

A. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer, anchoring all components plumb, level, square, and firmly into position for long life under hard use.

B. Drill holes to correct size and application that is concealed by item, with 1/4" tolerance.

C. Mount surface mounted accessories to back up with toggle bolts, plumb and aligned.

D. Anchor grab bars to resist 300 pound force in any direction.

3.04 ADJUST AND CLEAN

A. Adjust accessories for proper operation.

B. After completion of installation, clean and polish all exposed surfaces.

C. Deliver keys and instruction sheets to Owner.

END OF SECTION

SECTION 12 21 00
BLINDS

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Minimum of five years experience in manufacture of products specified.
   2. Manufacturer to be single source of units, including hardware, accessories, mounting brackets and fastenings.

1.02 SUBMITTALS

A. Samples:
   1. Two 12" pieces of slats, fabrics or other finished material, indicating full range of color.

B. Shop Drawings:
   1. Dimensions of openings scheduled to receive blinds or shades, based on field measurements.
   2. Illustrations of special components not detailed on manufacturer's data sheets.
   3. Details of divisions between adjacent units, abutments at corners, head and sill.

C. Manufacturer's Literature:
   1. Manufacturer's descriptive literature and installation for each type of unit utilized.

PART 2 - PRODUCTS

2.01 BLINDS

A. General: Window blinds shall be furnished and installed by the Contractor on all interior windows in the Computer Lab 116 and Fitness Training Room 117. The blinds shall **be JCPenney/Bali CustoMiser Mini Blinds as manufactured by Springs Window Fashions, Inc., Montgomery, PA, (800) 544-4749** complete with operation and installation hardware, or equal. Architect to select colors.

PART 3 - EXECUTION

3.01 INSPECTION

A. Check that surfaces to which work will be secured are sound and free of irregularities interfering with installation.

B. Do not begin installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's installation procedures, and accepted shop drawings.

B. Assure adequate clearance to permit unencumbered operation.

C. Position units plumb and true, and securely anchor in place with brackets, clips and fasteners.

3.03 ADJUSTMENT

A. Adjust clearances and overlaps to insure free operation.

B. Replace damaged items with new material.

C. Repair surfaces damaged by improper installation.

3.04 CLEANING

A. Remove protective coverings and devices.

B. Clean soiled components and leave Project site free of debris.

END OF SECTION

SECTION 21 00 01
EXISTING FIRE PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION

1. In addition to the general design requirements below there are a few specific requirements for this work. There is an existing sprinkler line that runs under a fresh air intake hood. This work shall include re-routing that pipe around the hood and providing additional sprinkler heads if needed. More information can be found on sheet A100 Overall Existing and Demolition Plan. Also, Alternate A-2 consists of adding a new lay-in ceiling in existing Restrooms and Locker Rooms 107, 108, 109, and 110. Existing sprinkler piping is not required to be moved, but currently exposed sprinkler heads will be required to be retrofit into the new lay-in ceiling tile system.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 23: All Mechanical Sections

B. Division 26: All Electrical Sections

1.03 QUALITY ASSURANCE

A. Qualifications of Installers:

1. Contractor shall be able to demonstrate satisfactory performance in work of equal magnitude and complexity.

B. Codes and Standards:

1. In addition to complying with all pertinent codes and regulations, comply with:
   a. All pertinent requirements of the National Fire Protection Association Standard, and Factory Mutual or IRI.
   b. All pertinent requirements of state and local authorities having jurisdiction.
   c. Owner's insurance company and local Fire Department.

1.04 SUBMITTALS

A. Shop Drawings:

1. Within 10 days after award of Contract, and before any fire sprinkler system materials are delivered to the job site, submit complete shop drawings to the Architect/Engineer in accordance with the provisions of Section 01 33 00 of these specifications:
   a. Prior to submittal for Architect/Engineer review, secure the approval and stamp of acceptance of the state or local authorities (as applicable).
   b. Shop drawings shall include a materials list describing all proposed materials by manufacturer's name and catalog number with catalog sheets.

B. As-Built Drawings:

1. During progress of the work, maintain an accurate record of all changes made in the fire sprinkler system installation from the layout and materials shown on the approved shop drawings.

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect fire sprinkler system materials before, during, and after installation and to protect the installed work of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the owner.

PART 2 - PRODUCTS

2.01 DESIGN

A. General:

1. The system shall be complete in all regards and shall include, but not necessarily be limited to the following:
   a. Coordination with other systems and their installation.
   b. Concealment of all piping in areas having ceilings other than the underside of the roof deck. (Piping in areas with no ceiling may be exposed, but shall be held to the minimum distance from the ceiling.)
   c. Work also includes careful coordination of sprinkler head locations with other trades, particularly where required to be concealed or installed in visible areas in an unobtrusive manner, e.g. where sidewall sprinklers are used. These areas must be identified with particular care on shop drawings and will require approval by the architect.

B. Sprinkler Heads:

1. All sprinkler heads in areas of exposed piping may be pendant or upright. Sprinkler heads in areas with finished ceilings shall be concealed type with flat white pop-off cover with escutcheon pieces finishing ceiling and cover frame, equal to Viking Horizon Mirage or Central B-4, concealed adjustable flush sprinkler head. Sprinklers shall be located in center of ceiling panels.

C. Coverage Rates:

1. Most areas shall be sprinkled with a wet system to meet NFPA 13 light hazard requirements for the noted occupancy.

D. The existing building is currently sprinklered. The existing system shall be modified as necessary to maintain compliance with NFPA 13. This shall include replacement and relocation of heads and extension of piping from bottom of roof structure to within new acoustical ceiling tiles in finished spaces. It shall also include relocation of heads as necessary where walls are removed or new walls are installed, and shall include relocation of all heads to the center of panels in the new ceiling grids.

E. The entire renovated area shall be sprinklered from the existing system. Include hydraulic calculations to the extent necessary to show that the finished system as extended is in compliance with the requirements of NFPA 13, including both existing areas and new areas.

2.02 MATERIALS

A. Piping indoors:

1. Pipe shall be black steel, seamless or welded, meeting ASTM A53 or A135 Gr A or B, threaded and coupled, plain, grooved end. Pipe wall thickness and joining requirements shall comply with NFPA 13 Chapter 3 and relevant recommendations of UL or FM. Fittings shall be 125 lb. cast iron screwed fittings meeting ANSI B16.4 and ASTM A126, or UL-FM approved grooved couplings by Victaulic, Gruvlok, Central Sprink, or National meeting ANSI/AWWA C606-87 standards for grooved joints.

B. Spare Parts:

1. Provide spare sprinkler heads and other spare parts as required by NFPA 13.

2.03 HANGERS, ANCHORS, AND SUPPORTS

A. Hangers and supports shall be Fee and Mason, Elcen, Michigan Hanger, Grinnel Company, Inc., or Bergen Pipesupport Corporation and suitable for size and type of pipe to be

supported.

B. Piping supports shall meet NFPA 13 requirements and the requirements of the owner's insurance company (e.g. FM or IRI if indicated).

C. No piping shall be hung from the piping of other trades or systems. Hangers shall be same material as the piping such that neither the hanger nor suspended piping is subject to electrolytic decay.

D. The following is a schedule of maximum spacing for hangers and supports and size of suspension rods for all steel and copper piping unless otherwise indicated or required. (Rods shall meet ASTM A 575).

PIPE SIZE	ROD DIAMETER	MAX. SPACING
up to 1-1/4"	3/8"	6'-0"
1-1/2" to 2"	3/8"	9'-0"
2-1/2" to 3"	1/2"	11'-0"
4" to 5"	5/8"	14'-0"

E. Drainage piping support shall meet requirements of respective pipe manufacturer and local codes.

F. Locate hanger supports and accessories to support pipe lines, valves, joints, and additional concentrated loads. They shall not restrict free thermal expansion unless otherwise shown.

G. OTHER MATERIALS:

1. All other materials, not specifically described but required for a complete and proper installation, shall be new, first quality of their respective kinds, and subject to the approval of the Architect/ Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to commencement of each stage of the fire sprinkler system installation, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that fire sprinkler system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect/Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been completely resolved.

3.02 INSTALLATION

A. Install the complete fire sprinkler system in strict accordance with all pertinent codes and regulations and the requirements of the authorities having jurisdiction.

B. Flush piping per NFPA 24 flow rates prior to sprinkler system hookup.

3.03 TESTING

A. Upon completion of the fire sprinkler system installation, furnish all personnel and equipment required and test and retest the complete system, making all adjustments necessary to secure the approval of the required local authorities, Owner's Insurance Company, and state and/or local fire authorities. 200 psig leak test is required per NFPA 24 leakage rates. Protect municipal systems as required.

3.04 ACCEPTANCE

A. After the fire sprinkler system authorities has been completely approved, secure a letter of final acceptance from the authorities having jurisdiction and deliver three copies of the letter to the Owner's Representative.

3.05 COORDINATION WITH OTHER TRADES

A. Fire protection contractor has the responsibility of coordinating the installation of his work with the work of other trades. In general the location of risers and main piping runs will be shown on the plan. Routing of all other piping is the responsibility of the contractor. To minimize difficulties associated with interferences in the field, contractor shall identify points of anticipated problems when his shop drawings are submitted and before fabrication of the piping, such that they may be addressed by the project team prior to time of system installation. Similar concerns must also be addressed in areas where piping must be hidden for aesthetic reasons, (e.g. in skylight areas and/or bulkheads, how will piping be run to minimize its visual impact). Work installed without regard to the spatial and functional requirements of other trades will have to be modified as necessary to meet both the fire protection system specifications and the needs of the other affected trade

3.06 TRAINING AND SERVICE

A. Provide clear and thorough written instructions on the operations of the fire protection system to the Owner.

END OF SECTION

SECTION 22 00 00
MECHANICAL AND PLUMBING SCOPE OF WORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

Contractor shall provide all labor, materials, equipment, permits, inspection fees, supervision, utility company charges, and other items noted in Contract General Conditions necessary to yield completely operable and tested systems as shown on the Drawings and specified herein. The work includes, but is not limited to, the following areas:

A. Building Work:

1. Plumbing:
    a. Sanitary drain, waste, and vent systems from all points of discharge and connections to existing sanitary system.
    b. Combined potable water service and fire protection service from five feet outside the building, including providing one 6-inch flanged connection approximately 12" above finished floor for fire protection.
    c. Domestic hot and cold distribution systems from new combined service to all points of use. All cross connection control equipment and piping as required by the State of Wisconsin Plumbing Code, and in accordance with local requirements.
    d. New plumbing fixtures and trim.
    e. Condensate drain system from mechanical equipment.
    f. Testing to verify compliance with lead regulatory requirements in completed domestic systems.
2. Mechanical Piping Systems:
    a. Hot Water Heating System including piping, valves and hydronic specialties as specified and required for a complete system.
3. Fire protection wet sprinkler system modified as needed for spaces altered.
4. HVAC
    a. New volume dampers, control dampers, VAV boxes, reheat coils, supply diffusers, return grilles, exhaust grilles, and accessories for a complete system.
    b. New DATT exhaust system including motorized dampers, exhaust fan, filters, supply and exhaust ductwork and duct silencer.
    c. Through walls silencers.
    d. Air distribution systems including ductwork, supply and exhaust grilles, registers and diffusers, hoods, balancing and control dampers, and related accessories.
5. Mechanical insulation for piping systems, ductwork, and equipment as specified.
6. Complete controls and instrumentation for new systems tied into existing control system.
7. System startup, testing, adjusting and balancing.
8. Piping and duct cleaning and pressure testing.
9. All pressure and temperature instrumentation not a part of any control system.

B. Equipment schedules are provided as a convenience to the Contractor, but do not relieve him of his responsibility to furnish all items shown on the Drawings and indicated in the Specifications.

C. Coordination with other trades.

D. Touch-up painting of damaged materials furnished by this Contractor and damaged by this Contractor. Each Contractor shall be responsible for replacement/patching of all finish materials which have been disrupted and/or damaged as a result of their construction procedures. All materials shall match original and all work shall be done by experienced field tradesmen.

E. One year labor and equipment guarantee on completed installation.

F. Cleanup associated with work of respective trades.

G. Flushing, cleaning, and pressure testing of installed systems.

H. No asbestos-containing materials or materials capable of discharging lead into potable water or air systems shall be used.

END OF SECTION

SECTION 22 01 00
MECHANICAL AND PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.01 STANDARDS

A. All work shall be executed in a professional manner and shall be coordinated with other work being performed at the site. The Architect/Engineer reserves the right to direct the removal and replacement of any item which in his opinion will not present an orderly and reasonably neat or workmanlike appearance. Such removal or replacement shall be at the Contractor's expense.

B. The Contractor shall pay all taxes, fees, licenses, permits and inspection costs required in connection with the work.

1.02 COMPLIANCE

A. All work and materials shall comply with all applicable laws and building codes and shall conform to the applicable sections of the following codes and standards. Where standards or codes are mentioned in these specifications, the edition or revision in effect during construction of this project shall be followed; hence, the specified numbers may be superseded by new numbers.

1. American Disabilities Act
2. Air Moving and Conditioning Associations, Inc. (AMCA)
3. Air-Conditioning and Refrigeration Institute (ARI)
4. American National Standards Institute (ANSI)
5. American Society of Civil Engineers (ASCE)
6. American Society for Testing Materials (ASTM)
7. American Society of Mechanical Engineers (ASME)
8. American Water Work Association (AWWA)
9. American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)
10. Applicable Codes of the State of Wisconsin and local agencies having jurisdiction
11. Cast Iron Soil Pipe Institute
12. Institute of Boiler and Radiator Manufacturers (IBR)
13. International Approval Services (IAS) (formerly AGA)
14. NAFM - Sound Test Codes
15. National Board of Fire Underwriters
16. National Electrical Code (NEC)
17. National Electrical Manufacturers Association (NEMA)
18. National Fire Protection Association (NFPA)
19. OSHA Standards, particularly #1910
20. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA)
21. Standards of the Hydraulic Institute
22. Underwriters' Laboratories (UL)
23. The Instrument Society of America

1.03 SUBSTITUTIONS AND CHANGES

A. Comply with applicable requirements of Division 1 including Section 01 33 00 Submittal Procedures and Section 01 25 13 Product Substitution Procedures.

B. It shall be the responsibility of the contractor to notify all parties concerned of any changes or substitutions he has been authorized to make, and he must include in his notice a full description, including drawings, if necessary, of any deviation from dimension shown on the plans or applicable to manufacturer's named on schedules and named in specifications.

C. If equipment is provided other than that upon which the design is based, contractor shall coordinate the installation with the work of all other trades and with the space available for installation. Contractor shall pay for any changes caused to other trades as a result of this substitution, plus the additional cost of any required engineering needed to incorporate the proposed alternates.

D. Elevation of piping, ductwork and equipment indicated on drawings are to be used as guidelines to assist Contractor with installations. Minor changes to these elevations may be necessary to eliminate unforeseen interferences. The Contractor shall obtain the Architect/Engineer's written approval before proceeding with any changes in elevations.

1.04 EQUIPMENT LISTS AND IDENTIFICATION

A. Each Contractor supplying equipment items shall furnish three sets of construction books and spare parts list recommended for the proper operation and maintenance of the equipment. State exact quantity so there is no ambiguity.

B. All major parts of built-up equipment or devices shall bear the manufacturer's nameplate; giving name of manufacturer, description, size, type, serial number, electrical characteristics, and related data.

1.05 DRAWINGS

A. Due to the scale of the drawings, it is not always possible to indicate all offsets, fittings, valves, and similar items which may be required. This Contractor shall carefully investigate the structural and finish conditions affecting his work and shall plan accordingly, furnishing such valves, fittings, offsets, vents, drains and specialties as may be required to meet such conditions. All piping shall be installed as closely as possible to walls, ceiling, columns, and other structures (consistent with the proper space for covering, removal of pipes, valve access, and other maintenance relationships) so as to occupy a minimum of space and all offsets, fittings, valves, and similar items required to accomplish this must be furnished by the Contractor without additional expense to the Owner. In case interferences develop, the Architect/Engineer shall decide which work is to be relocated regardless of which was first installed.

B. Before submitting his proposal, the Contractor shall examine the architectural, electrical and mechanical drawings and, if any discrepancies occur between them and this specification, he shall report same to the Architect/Engineer in writing prior to bidding and obtain written instructions for changes in the work.

C. In case of a difference between the plans and specifications, or between specifications, the decision of the Architect/Engineer shall prevail.

D. The Contractor shall keep a set of prints on which each he will mark line and grade and other changes made during installation. All changes shall be made through the Construction Manager with Architect/Engineer approval. At the end of the job, or when requested, he will make this information available to the Architect/Engineer for revision of the design drawings for records. Comply with the requirements of Section 01782 Project Record Documents.

1.06 SITE AND JOB CONDITIONS - DIMENSIONS AND MEASUREMENTS

A. Before submitting proposals, bidders shall visit premises, verify site conditions and conditions under which work under this contract must be conducted. Submission of proposal signifies that bidder has visited premises, has made said examinations and verifications and is fully conversant with all said conditions. No claims for additional compensation will be considered or paid, due to failure to be so informed.

B. Before commencing work, examine all spaces, surfaces and areas indicated on drawings to receive work. Report necessary corrections in writing immediately to the Architect/Engineer. Do not proceed until corrections (if any required) have been made. Commencing work signifies acceptance of said spaces, surfaces, areas and of job conditions.

C. Verify all dimensions shown on the drawings and obtain all measurements required for proper execution of work.

D. Information pertaining to preliminary investigations, such as test borings, location of utilities, existing structures and existing grades appear on the drawings. While such data has been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing or that unforeseen developments may not occur. The interpretation of results of such investigation shall not be the responsibility of the Architect/Engineer. Where underground services, utilities, structures, buried tanks and other concealed items are located on the drawings or information is provided at the site, this data is based on available records, but not guaranteed to be complete or correct. They are merely given for assistance.

1.07 RIGGING; SUPPORTS AND FOUNDATIONS

A. The respective Contractor shall furnish and be responsible for delivery into the premises and erection of any equipment furnished.

B. Brackets, hangers, curbs, supports, and miscellaneous steel as required in connection with distributing piping loads and equipment supports shall be provided by the Contractor for equipment and piping which he installs.

C. Contractor shall furnish and install all foundations and supports as may be necessary for the respective equipment manufacturer's recommended installation procedures, and shall be responsible for their locations and size whether or not shown on the drawings. Grout under floor mounted equipment bases, or block under roof or elevated steel platform mounted equipment bases, so that same are plumb and level.

D. All fixtures, equipment and materials shall be supported and fastened in a manner satisfactory to the engineers. Ample backing shall be provided where plumbing fixtures, control panels or other items are supported on walls or partitions. Phillips, A & J, or Ramset anchors shall be used for block or tile walls. Toggle bolts shall be used only when other fastening systems are not suitable. Inserts shall be used wherever possible in concrete.

1.08 ELECTRICAL WORK

A. This Contractor shall furnish all electrical devices requiring mechanical connections such as pressure switches, float switches, thermostatic switches, limit switches, solenoid valves, motor operated valves, other in-line items, and also including motors, unless otherwise indicated. Motors for all mechanical equipment shall be mounted by Mechanical Contractor. Provide magnetic motor starters where specified on packaged equipment.

B. All electric motors shall be high efficiency.

C. Equipment furnished shall comply with Electrical Specifications.

1.09 PIPE AND DUCT SLEEVES AND ESCUTCHEONS

A. Provide sleeves for all piping and duct work passing through walls, floors, ceiling and partitions. Sleeves shall be 18 gauge galvanized sheet metal unless otherwise specified. Sleeves through boiler room or fire-rated areas roofs, walls, floors and foundation shall be standard weight steel pipe or cast iron pipe sleeves for piping or 1/8" plate and angle iron for ductwork unless otherwise specified. Pipes passing through walls below grade shall utilize Clow F1429 or U.S. Pipe mechanical joint wall sleeve where applicable, and be caulked with lead and Oakum. Link-Seal bolted rubber materials may also be used to seal pipe to sleeve on cold piping where fire rating is not required.

B. Sleeves shall be flush with walls unless otherwise indicated.

C. Conceal all pipe sleeves with chrome plated escutcheons in finished areas.

D. In unfinished areas, sleeves shall project one (1) inch above finished floor line and be sealed watertight to the floor unless higher projection are indicated.

E. Sleeves passing through walls or floors below grade above a finished floor line shall be made watertight with a plastic material as approved by the Architect/Engineer.

F. All openings around duct and pipes and all sleeves where floors, fire rated walls and smoke barriers are penetrated shall be caulked smoke tight with 3M Fire Barrier CP-25, 3M Putty, and FS-195 Wrap/strip or approved equal by Hilti meeting U.L. System 91 and ASTM E-814 (UL-1479), installed per manufacturer's recommendations for horizontal and vertical penetrations. Fiberglass is not acceptable. Where vapor barriers must be continued on cold piping, they shall remain intact through the penetration and also sealed with 3M material per U.L. 91.

1.10 ACCESSIBILITY FOR REPLACEMENT; MAINTENANCE AND REPAIR

A. The respective contractors shall provide access covers or doors for equipment which is concealed and must be serviced, operated or maintained. Equipment shall include, but not be limited to valves, traps, cleanouts, critical dampers, control devices, filter, strainers, and related devices. Minor deviations from drawings may be made to allow for better accessibility, but major changes shall not be made without approval of the Architect/Engineer.

B. Furnish and install Milcor, Babcock-Davis, Bilco, Cessco or American Hatch Corporation access panels of proper style to match adjacent finish and approved sizes. Locations shall be approved by the Architect/Engineer or as shown on the plans. Use stainless steel access panels in ceramic tiled walls. Access panels in fire walls or rated ceiling assemblies shall be UL labeled with a rating equal to that of the wall in which it is installed.

C. Access panels shall be size large enough to allow proper maintenance of respective equipment for which they are installed.

D. Access panels shall be provided by responsible trades, who shall then coordinate installation of the access panel with the effected trade.

1.11 CUTTING AND PATCHING

A. All cutting and patching shall be performed only by workmen skilled in the type of work involved.

B. No structural members shall be cut without the consent of the Architect/Engineer and all such cutting, when authorized, shall be done in strict accordance with the instructions of the Architect/ Engineer. Where piping must pass through structural members and the Architect/Engineer has approved the burning of holes in such member, the Contractor shall provide approved welded steel reinforcement of suitable dimensions adjacent to the hole to effectively offset the weakening effect of the hole upon the member.

C. The size and location of roof and wall openings shall be the responsibility of the particular mechanical trade coordinated with other trades. Cracks and rough edges left following installation of equipment shall be caulked or covered with suitable escutcheons or framing by the Contractor.

1.12 EXCAVATION AND BACKFILL

A. General:

1. The respective contractors shall do all trench and pit excavation and backfilling required for his work inside and outside of the building, including all required shoring, bracing, pumping, and all protection for safety of persons and property. Materials to be excavated shall be non-classified and shall include all earth or other materials encountered.

2. Unless otherwise shown or specified, provide separate trenches for each utility. Lay all piping in open trench except when the Architect/Engineer gives written permission for tunneling.

3. The Contractor, in making or causing to be made any trench or excavation on public property or property to which the public has access, shall enclose, support and barricade his work, display warning devices, including red illumination at night and take all necessary precautions to protect the public at large from accidents while the excavation is open.

4. See Division 31 of the Specifications for additional requirements.

B. Method of Excavation: All excavation shall be open cut from the surface, except in special cases as designated on the plans. All excavations for trenches, for sewer, water and other piping, and for associated appurtenances shall be made in such manner and to such depth and width as will give ample room for building the structures and for bracing, sheeting, and supporting of the sides of the excavation, for pumping and draining of groundwater and sewage which may be encountered, and for the removal from the trench of all materials excavated. Special care must be taken so that the soil below the bottom of the structure to be built shall be left undisturbed so that a firm bed will be provided for the structure.

C. Limits of Excavation and Subgrade Preparation:

1. Trenches for pipe shall be excavated so that there will be a minimum clearance of six (6) inches on each side of the barrel of the pipe, and a maximum width of trench at the level of the top of the pipe of not more than sixteen (16) inches greater than the O.D. of the pipe, for pipe thirty (30) inch I.D. or smaller. They shall be at all times of sufficient width to permit the pipe to be laid and to permit proper construction methods to be used.

2. Sufficient space shall be provided in the trench to permit the joint to be properly made. Joint holes may be provided in the excavation with overhanging sides, provided the material excavated is of such a nature as to make this procedure safe for the workmen. Bottom of trenches shall be evenly graded to insure uniform bearing for the length of the pipe except where joint holes are necessary. Excavate all rock, cemented gravel, old masonry or other hard material to a depth of at least four (4) inches below pipe bearing grade and fill with sand or fine gravel firmly compacted to 95% Modified Proctor.

D. Amount of Opening: In excavating for sewers the excavation shall at all times be finished to the required grade for an adequate distance in advance of the completed sewer, but unless otherwise permitted by the Architect/Engineer, not more than one hundred (100) feet of trench shall be open at one time in advance of the sewer.

E. Bracing and Sheeting: The Contractor shall furnish, put in place and maintain such sheeting, bracing and shoring as may be required to properly support the sides of any excavation and to prevent any movement of earth which could in any way injure the work under construction or other adjacent property or workmen. If the Architect/ Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports at the expense of the Contractor, but neither the placing of such additional supports by the order of the Architect/Engineer, nor the failure of the Architect/Engineer, to order such additional supports placed, shall release the contractor from his responsibility for the sufficiency of such supports and the integrity of the work. In the removing of sheeting and bracing after construction, special care shall be taken to prevent any caving of the sides of the excavation and injury to the completed work or to adjacent property. OSHA and applicable state requirements shall be followed.

F. Timber Left in Trench: no sheeting, bracing or other timber shall be left in the trench upon completion of the structure, without order of the Architect/Engineer. All timber must be removed as the backfilling of the trench goes forward unless otherwise ordered by the Architect/Engineer. The Contractor shall leave such sheeting, bracing or timber, as the Architect/Engineer orders in writing, for the purpose of preventing injury to the completed structure, adjacent structures, property or workmen. In no case shall ends of timber,

sheeting, or bracing left in the trench be allowed to come nearer than two feet from the established finished grade.

G. Disposal of Excavated Material: All suitable excavated material shall be used in backfilling over the sewer and appurtenances or distributed otherwise by the Contractor. All excavated material in excess of the quantity required for backfilling shall be hauled away by the Contractor and disposed of by dumping offsite. The Contractor shall provide all necessary labor and equipment for the spreading of all such excess material at the place of dumping and shall keep the dumping ground in neat condition satisfactory to the Architect/ Engineer.

H. Extra Earth Excavation: In case soft material is encountered in the bottom of a trench or underneath a special structure, which is not indicated by soil boring data and which in the opinion of the Architect/Engineer is not suitable, the Architect/Engineer may order the removal of this soft material and its replacement with concrete or other material in order to make a suitable foundation for the construction of the sewer or structure. Any extra excavation made at the order of the Architect/Engineer will be paid for on the basis of the actual quantity of material excavated.

I. Extra Sand Backfill: Any extra sand backfill made at the order of the Architect/Engineer will be paid on the basis of compacted volume in place. The sand furnished by the contractor for payment under this item, shall be natural sand free from organic matter, clay balls and stones having a diameter greater than one inch.

J. Extra Sand Bedding: Any extra sand bedding made at the order of the Architect/Engineer will be paid for on the basis of the compacted volume, in place. The sand furnished by the contractor for payment under this item, shall be natural sand free from organic matter, clay balls and stones having a diameter of greater than one inch. This item is intended to provide sand as a bleeding material when unsuitable material is encountered below pipe grade.

K. Concrete Work: All concrete work for monolithic concrete sewer construction, reinforced concrete pipe, manholes, catch basins, and all other concrete structures shall be made in accordance with the Standard Specifications for Highway Construction, latest edition.

L. Backfill:

1. Backfill trenches only after piping has been inspected, tested and locations of pipe and appurtenances have been recorded. Subsidence shall take place after backfilling. Backfill by hand around pipe with sand or fine gravel from the bottom of the pipe excavation to a level one (1) foot above the top of the pipe unless shown otherwise on the plans or as may be directed by the Architect/Engineer during the course of the work. Tamp firmly in layers not exceeding six (6) inches in thickness, taking care not to disturb the backfill, using equipment suitable for the kind of soil being compacted. Under floors, pavements, walks, and other surfacing, the backfill material shall be sand, back run gravel or limestone screenings compacted with a vibrating compactor for the full depth in layers not thicker than six (6) inches. Backfilling from above the pipe to the top of the trench excluding surface restoration for trenches located in, along, or within ten (10) feet of permanent pavements shall be backfilled with sand or fine gravel. This material shall be placed in thin layers and mechanically compacted with suitable equipment. This sand or gravel material shall be brought up to finish grade unless surface restoration has been shown. All backfilling shall be compacted to 95% Modified Proctor Density as established by the American Association of State Highway Officials. When laying pipe in impervious clay and backfilling with sand, the top two (2) feet of backfill shall be clay to seal the trench and reduce the possibility of water collecting in the trench. This must be done as soon as possible after laying the pipe.

M. Surface Restoration: No basic surface restoration within the Owner's property will be necessary for the construction of the utilities except as per the backfilling specifications above. In particular, all topsoil shall be replaced and the area shall be left in a natural condition.

N. Clean-up Limitation:

1. The Contractor will be expected to maintain cleanup operations within a reasonable distance of the sewer being placed in the trench. Cleanup shall consist of leveling and backfill, removal of excess excavation and construction debris, and gravel repair of roads and driveways.
2. If the Contractor does not maintain cleanup, as specified, the construction will be stopped until cleanup is carried out to the satisfaction of the Architect/Engineer.

1.13 EXISTING SERVICES

A. Where existing services such as sewers, domestic and heating piping, gas, electric or other services are encountered, each affected Contractor shall take adequate steps to protect such services.

B. If such existing services require relocation, make written request for ruling from the Architect/Engineer. Do not proceed on such portions of the work until written instructions are received. Costs involved shall be negotiated.

C. Inactive services shall be plugged, capped or removed. Notify utility companies, municipal agencies having jurisdiction or Owner's Representative. Protect or remove as directed.

D. Interruptions:
1. Where existing services (e.g., water supply, fire protection, and sanitary sewers) must be interrupted for connections by this Contractor, such interruptions shall be scheduled a minimum of one (1) week in advance with Owner's Representative.
2. Where line interruptions are required to make connection (e.g., steam and condensate), the Contractor shall make arrangements with the Owner's Representative to complete connection AFTER normal working or occupancy hours.

1.14 BASIC MATERIALS AND METHODS - GENERAL

A. All materials and equipment required for the work shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail and shall be so selected and arranged as to fit properly in the building spaces. Where a specific kind or quality of material is not specified, a first class standard article as approved by the Architect/Engineer shall be furnished.

B. Each Contractor shall furnish the services of one or more experienced superintendents who shall be in charge of the installation of his work together with all skilled workmen, fitters, plumbers, metal workers, electricians, welders, helpers, and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.

1.15 LUBRICATION

A. Upon completion of the work and before turning same over to the Owner, Contractor shall clean and lubricate bearings in pumps, air handling equipment and other rotating machinery, except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

1.16 PAINTING

A. All manufactured mechanical equipment shall be furnished with the manufacturer's standard shop finish unless specified otherwise in other sections of this specification.

B. All equipment furnished and installed by this Contractor with a factory applied baked enamel finish shall not be painted, but any damaged spots shall be touched up to match.

C. All prime and finish painting specified, except as noted above, shall be done by the Painting Contractor.

1.17 EQUIPMENT AND SYSTEM IDENTIFICATION

A. Contractor shall identify every system he installs after covering and/or finish painting. This also includes all piping and ductwork in equipment rooms, above ceilings, or exposed. Use Seton

"OptiCode", Emed "Economark", Brady, or other approved equal legends, every twenty (20) feet on center, with flow arrows designating the particular service, utility, process or system. Where walls, floors or other surfaces are penetrated, identify on each side. Size of lettering and band color shall conform to ANSI A 13.1 and OSHA regulations, and are to be listed by Contractor and approved by Architect/ Engineer.

1. Background field shall be the color scheduled below, and shall extend around the pipe and 2" beyond the wording and arrows in both directions.
2. The word identifying the pipe shall be as scheduled below and of a color to contrast with the background field.
3. On 2" or larger piping or covering, the letters shall be 2-1/2" high, length to suit, applied lengthwise. Piping or covering smaller than 2" shall be marked in a similar manner, but letters shall be 1-1/8" high. Lettering shall be positioned so that it is easily readable from the floor or ceiling access panel.
4. System Color Coding and Wording: Identify each piping and plumbing system in accordance with the facilities existing identification system. Confirm label text and color with Owner.
5. Provide for the identification of all this will include but is not limited to fans, heating and ventilating units, condensing units, starters, switches, panels, and isolated pumps. Identification must be coordinated to provide a quick means of identifying the interrelationship between mechanical and electrical equipment and the area served by the equipment. Equipment identification tags shall be consistent with and an extension of the facility's existing equipment identification – confirm equipment tags with Owner.
6. Valve Tagging:
    a. All valves shall be tagged with 2"x 3" plastic engraved tags bearing the valve identification number. Valve tags shall be as made by Seton "Setonply", Brady, or other approved equal. The Contractor shall furnish a typewritten chart indicating the fixtures or areas supplied by each numbered valve and shall mount same in a frame, under glass, as directed in the field by the Owner's Representative.
    b. Tags shall be an appropriate background color, same as pipe labeling, for the respective service.
    c. COORDINATE VALVE NUMBERS WITH THE OWNER TO MATCH THE EXISTING NUMBERING SYSTEM IN USE AT EACH FACILITY.
7. Identify all duct volume dampers by spray painting damper handles fluorescent orange.

B. Identify VAV box locations with two-ply 1/16" engraved nameplates, with black letters on white background bearing "VAV-X", ¾" high. Apply self adhesive nameplates to the ceiling grid beneath the VAV box location.

1.18 GUARANTEE

A. Each Contractor shall guarantee his installation for a period of one (1) year from the date of final acceptance against all defects in material and/or workmanship and ordinary wear and tear. He shall make any and all adjustments to the system and minor alterations as required to place the system in satisfactory operating condition at no extra cost to the Owner.

1.19 EQUIPMENT FURNISHED BY THIS CONTRACTOR

A. The intent of these specifications is to allow the manufacturer's standard design and construction where suitable. The equipment should have the basic quality, however, as specified. See specific equipment sections for additional requirements.

B. All manufacturers offering equipment for this project shall furnish to the Architect/Engineer complete information describing the design performance, equipment experience, and other pertinent information necessary for review. In addition, the location of the manufacturer's

Service Engineer who will be responsible for servicing the equipment furnished shall be provided. Additional information may be required by the Architect/Engineer after submittal.

C. Prices shown in the proposal for alternative equipment shall include all structural, mechanical or electrical changes from that shown on the plans which will be required for the installation of the alternate equipment. The plans and specifications have been prepared on the basis of equipment manufactured by those firms listed in the drawing schedules and specifications. All equipment listed in the proposal will be considered carefully on the basis of advantages, disadvantages, and economics.

D. The Contractor shall guarantee all equipment installed for one (1) year from the date of acceptance by the Owner's Representative. If prior to the duration of one year, any equipment of parts thereof are found to be defective, the Contractor shall replace the part at no cost.

E. Manufacturer's Services:

1. All equipment shall be given one (1) coat of shop prime, unless otherwise indicated.
2. Lubrication facilities shall be located for convenient servicing. Lubrication, maintenance instructions and one (1) year supply of recommended lubricant, properly labeled, shall be furnished with all equipment.
3. Any special tools, including special grease guns, required for maintenance or adjustment of the equipment shall be furnished with the equipment.
4. Upon completion of the installation of the equipment or before initial operation, three (3) bound sets of complete operating and lubricating instructions for all equipment shall be furnished to the Owner by the Contractor. Included with the operating instructions shall be a complete set of all equipment drawings including shop drawings, repair instructions, complete parts list, lubrication instructions and recommended lists of lubricants.

1.20 SHOP DRAWINGS

A. Contractor shall provide shop drawings as required by Section 01 33 00 – Submittal Procedures of these specifications

B. Shop Drawings shall provide complete details of the material or equipment they describe including dimensions, gauges of materials, weights, finishes, motor horsepower, voltage, current, starting characteristics, operating characteristics, building location room number, capacities, rough-in connections, installation requirements, and complete internal and external wiring diagrams showing all connections, along with fan and pump curves where applicable.

C. In particular, shop drawings on the following equipment items shall be furnished within 15 working days from work of contract to maintain Proposal Schedule.

1. Roof or Floor Mounted Equipment affecting Building Structure (e.g. air handling units, exhaust fans, ventilators).
2. Floor, wall, or beam column mounted equipment requiring special foundations or supports (e.g. boilers, drainage equipment, tanks, etc.).

1.21 TEMPORARY HEAT

A. Use of permanent equipment for temporary heating shall be only as allowed by the General Requirements section of these specifications.

1.22 SAFETY

A. Contractor shall be responsible for job site safety.

B. Contractor shall comply with OSHA regulations for confined space entry locations.

END OF SECTION

SECTION 22 02 00
PIPING PRESSURE TEST REPORT

Line Number or System: _____

Date of Test: _____ / _____ / _____

Test Medium: WATER AIR NITROGEN OTHER - SPECIFY _____

Test Pressure: _____ PSI _____ FT

Time Held at Test Pressure:_____ HOURS_____ MINUTES

CHECKLIST TO BE COMPLETED AFTER PRESSURE TEST		
	NOT APPLICABLE	**COMPLETED**
System Drained		
System Air Dried		
Temporary Equipment (e.g. pressure gauges, blind flanges, caps, etc.) Removed		
Permanent Equipment (e.g. safety valves, relief, valves, gauges, etc.) Replaced		
Valving Returned to Proper Configuration		

REMARKS:

I certify this system to be leak free and structurally sound as of the date of the test.

FIELD TECHNICIAN (sign and print): _____

SYSTEM ACCEPTED:

_____ _____
OWNER'S REPRESENTATIVE DATE

Use this form (or equal) for domestic water, sanitary, hot water heating, chilled water and gas systems.

END OF SECTION

SECTION 22 07 00
INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Insulation required for this work includes, but is not necessarily limited to the following:

1. Piping and In-Line Equipment:
   a. Above ground condensate drains not in mechanical rooms. This also includes overhead floor drain or open site drain piping draining condensate from air conditioning units and any other concealed cold drain.
   b. Domestic hot, hot water recirculation, and cold water above ground.
   c. Domestic hot and cold water and drain piping under handicapped lavatories. Refer to Section 22 10 00.
   d. Heating hot water systems including all piping, equipment and accessories.
   e. Chilled water systems including all piping, equipment and accessories.
   f. Plenum fire barrier wrap insulation on PVC piping installed in air plenums.
2. Ductwork
   a. HVAC supply that is not double wall insulated duct.
   b. Return ductwork shall be insulated only on mechanically cooled systems and only where it passes through non-cooled spaces such as mechanical rooms. Insulation shall be installed on all return ductwork in non finished space between the new office and classrooms and the mechanical room. Insulation is not required above ceilings within the building insulation envelope.

B. Related Work Described Elsewhere:

1. Section 22 10 00: Plumbing
2. Section 23 00 00: Heating, Ventilating, & Air Conditioning
3. Section 23 52 00: Hot Water Heating Systems

1.02 QUALITY ASSURANCE

A. Qualifications of Installers:

1. For the actual 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.
2. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of installers.

1.03 SUBMITTALS

A. Materials List:

1. Within 15 days after award of Contract, and before any of the materials of this section are delivered to the job site, submit complete materials list to the Architect/Engineer in accordance with the provisions of Section 01 33 00- Submittal Procedures of these specifications. The list shall identify all materials and equipment proposed to be furnished and installed under this portion of the work, giving manufacturer's name, catalog number, and catalog cut for each item where applicable. Submittals shall include a description of insulation materials, heat transfer data, thicknesses, jackets, adhesives, and methods of application on pipe, duct, fittings and surfaces.

B. Manufacturer's Recommendations:

1. Accompanying the materials list, submit the manufacturer's current recommended method of installation for the insulation required in this work.

1.04 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacement:

1. In the event of damage by this Contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All insulation, unless otherwise indicated, shall have composite (insulation, jacket and adhesive used to adhere the jacket to the insulation) Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50

Accessories, such as adhesives, mastics, cements and cloth to fittings shall have the same component ratings as listed above. Paper laminate jackets shall be permanently fire and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity. The insulation contractor shall verify in writing, prior to installation, that all products to be used meet the above criteria.

B. Contractor shall provide all adhesives, mastics mechanical fasteners, etc., as specified herein and as required. Adhesives, equal to those specified, shall be provided and applied in accordance with manufacturer's published recommendations, and shall be as manufactured by Dow Corning, Foster Products, Johns Manville, Owens Corning, or approved equal.

C. Preformed insulated fittings and jackets shall be as made by Proto PVC Corporation or Johns Manville. PVC covers such as Proto or Zeston, may be used throughout the piping systems.

D. NFPA 90-A and NAIMA standards shall be met as applicable.

2.02 PIPING INSULATION

A. Plumbing, Hot Water Heating Systems and Chilled Water Cooling Systems

1. Preformed fiberglass pipe insulation manufactured in accordance with ASTM C-547, with a 'K' factor of 0.23 Btu-in/hr-sf/ F @ 75 F mean temperature, shall have a pre-applied all service jacket. A vapor barrier shall be maintained on cold piping by sealing all staples and raw insulation ends and fittings. Insulation shall be as made by Johns Manville Micro-Lok 850-AP or AP-T, or equal by Owens-Corning, Knauf, or Manson Insulation.

2. Fittings, Valves, Flanges, Strainers, Flexible Connectors, Suction Diffusers, Unions, etc.:

a. Hot Piping: Fittings shall be insulated by applying factory precut insulation inserts to the fitting per Manville Hi-Lo Temp insulation insert recommendations and covered with 25/50 PVC covers. Other piping components shall be insulated with approved insulating cement of thickness equal to adjoining pipe insulation, with glass fabric cover adhered and finished with fire resistive lagging adhesive. Contractor may also insulate with mitered segments of

fiberglass pipe insulation, secured with No. 20 gauge galvanized steel wire, and finished with smoothing coat of insulating cement and glass fabric, as above. Cover all sizes with applicable pre-molded PVC insulation fittings, as made by Proto PVC Corporation and Johns Manville. Wrap other areas not suitable for pre-molded PVC fittings with fiberglass cloth and insulating mastic.

b. Cold Piping: Insulate same as hot piping but maintain continuous vapor barrier with mastic, including sealing all staples and raw insulation ends at fittings.

B. Thickness Schedule:

		Pipe Size	Thickness
1.	Domestic hot, hot recirc, and cold water above ground, overhead condensate drains	all	1"
2.	Roof conductors and roof sumps	all	1"
3.	Hot Water Heating	½" – 1.1/2"	1"

Note: Where pipe chase dimensions or interference problems make use of the specified thickness impossible, local reductions in thickness may be made with Architect/Engineer approval.

2.03 DUCTWORK INSULATION

A. Concealed Ducts:

1. Ducts shall be insulated on the outside with flexible glass blanket, equal to Johns Manville R-Series Microlite duct insulation, 3/4 pound density, with FSKL aluminum facing, installed per manufacturer's recommendations. Thickness on supply and return air ducts shall be 1-1/2". Thickness on outside air, mixed air, and exhaust/relief air shall be 2".
2. Outside air plenums shall be insulated with rigid fiberglass board of 3.0 lbs. per cubic foot density equal to Johns Manville 814 Spin-Glas with FSK facing and vapor barrier, or Manson AK board, 2" thickness.

B. Exposed Ducts (including mechanical rooms):

1. Ductwork shall be insulated with rigid fiberglass board of 3.0 lbs. per cubic foot density equal to Johns Manville 814 Spin-Glas with FSK facing and vapor barrier and covered with fiberglass cloth and lagging adhesive.
2. Exhaust air ductwork shall be insulated with 1-1/2 inch thickness beginning 2 feet upstream of exhaust fan shutoff damper and continuing to relief louver.
3. Supply air ductwork shall be insulated with 1-1/2 inch thickness.

2.04 OTHER MATERIALS

A. All other materials, not specifically described, but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and subject to approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that all the work of this section may be installed in accordance with all pertinent codes and regulation, the original design, and the approved shop drawings.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect/Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION

A. General:

1. Contractor shall be responsible for examination and acceptance of all surfaces and conditions prior to delivery and installation.
2. Install all insulation in strict accordance with the respective manufacturers' recommendations as approved by the Architect/Engineer.
3. Insulation shall be applied on clean, dry surfaces and after inspection and release for insulation application. All insulation shall be continuous through wall and ceiling openings and sleeve. Pipe insulation shall be continuous through pipe hangers. All joints shall be butted firmly together. Longitudinal jacket laps and butt strips shall be smoothly secured according to manufacturer's recommendations.
4. When covering is terminated at equipment, specialties, or access doors; or where jackets are pierced by metal parts such as thermometers or pressure gauges, covering material shall be neatly tapered and jacket securely sealed to pipe or other metal part.

B. Piping Insulation Installation:

1. Piping insulation shall be installed with all joints tightly butted; with overlapping longitudinal joints integral with jacket, and with 3" wide separate butt strips; tightly sealed with adhesive. Exposed insulated piping shall be provided with a finish suitable for a final coat of paint. Concealed insulation will not be painted nor will aluminum jacketed pipe.
2. Insulation covering on heated piping shall be neatly trimmed where penetrated by support shoes where slides are used or support inserts where rollers are used.
3. Insulation on all cold surfaces where vapor barrier jackets are used must be applied with a continuous unbroken vapor seal. Hangers, supports, anchors and guides that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation. Stapling of vapor barrier jackets on cold piping will be permitted only if the staples are sealed within approved vapor barrier mastic or vapor barrier tape.
4. Rigid insulation inserts shall be installed at outside hangers and pipe resting on structural steel. Inserts between pipe and pipe supports shall consist of Johns Manville Thermo-12 or Calsilite rigid pipe insulation for services below 35°F or wood blocks equal to "Buckaroos" for services above 35°F. The inserts shall be of thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Inserts shall be of sufficient density to avoid crushing of insulation and damage to vapor barrier. Insulation inserts shall not be less than the following lengths, unless otherwise specified:

1/2" to 2-1/2" pipe size	10" long
3" to 6" pipe size	12" long
8" to 10" pipe size	16" long
12" and over	22" long

Galvanized metal protection shields equal to Grinnel Fig. 167 or equivalent by "Buckaroos" shall be applied between hangers or supports and the pipe insulation. Shields shall be formed to fit the insulation and the length specified for the hanger

inserts less 4 " to allow for vapor sealing butt joints in each side of the shields. On piping 6 inches and above pipe covering protection saddles equal to Grinnel Figures 160 through 165 shall be used

Insulation inserts and shields shall be provided by the respective piping Contractor; such as plumbing, process piping, heating and cooling, etc.

5. Specified adhesives, mastics and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.
6. Where metal jackets are used, installation on pipe, fittings, valves, flanges, and other piping accessories shall conform to Pabco recommendations.
7. Install Armaflex or Manville Aerotube per manufacturer's recommendation.

C. Hot Equipment Insulation Installation:

1. Cut, score, or miter insulation to fit contour of equipment and secure with 3/4" x .020" galvanized steel bands or 16 gauge galvanized wire on 12" centers. Weld pins or stick clips with washers, may be used for flat surfaces and spaced 18" apart. Stagger joints where possible and fill voids with insulating cement. Apply 1" galvanized hexagonal wire mesh over entire surface of equipment, and apply a coat of insulating cement to smooth out surface. When cement is dry, apply a coating of fire retardant lagging adhesive. Embed a layer of open weave glass cloth overlapping all seams 2", and finish with a second coat of the same adhesive.

D. Install cold equipment insulation on clean surfaces using manufacturer's recommended adhesives, joining requirements, and finishing vapor barrier coating.

E. Duct Insulation Installation:

1. Rigidboard:
   a. Impaling over pins (concealed):
      i. All insulation shall be applied with edges tightly butted. Insulation shall be impaled on pins welded to the duct and secured with speed clips. The protruding ends of the pins shall be cut off flush after the speed clips have been applied and sealed with Tape Patch. Spacing of pins shall be as required to hold insulation firmly against duct surface, approximately one pin per square foot. All joints and penetrations of the vapor barrier shall be sealed with 3" wide aluminum foil pressure sensitive tape.
   b. Impaling over pins (exposed):
      i. All insulation shall be applied with edges tightly butted. Insulation shall be impaled on stick clips or pins welded to the duct, and secured with speed clips. Spacing of pins shall be as required to hold insulation firmly in place in accordance with minimum SMACNA or manufacturer's standards. All joints and penetrations of the vapor barrier shall be sealed with a 3" wide strip of matching pressure sensitive tape.
   c. Other methods of securement:
      i. If, through space or size restriction or other causes, the welded pin method is impossible, the insulation shall be secured to the duct with adhesive that meets NFPA 90-A 25-50 Code as recommended by the manufacturer. The adhesive shall cover the entire surface of the sheet metal when applied to underside of horizontal duct, but may be applied in strips or spots for application to top and sides with a minimum of 50% coverage.
2. Concealed Ductwork:
   a. Flexible fiber glass duct insulation shall be applied cutting the insulation longer than the perimeter of the duct to provide a 2" staple lap and minimum compression at the corners. All joints shall be lapped 2" and stapled with outward clinching staples 2" on center. The insulation shall be mechanically

fastened to the underside of the ducts 24" wide or more using cup-head pins, weld pins, or stick pins with speed clips 18" on center. All joints and penetrations of the vapor-barrier jacket shall be sealed with a minimum 3" wide matching pressure sensitive tape. Loose or carelessly taped joints will necessitate returning to the job and repairing as required.

b. Insulation covering on stiffeners on exposed and concealed ductwork shall be a minimum of 1/2" thick.

c. Avoid excessive compression of flexible duct insulation during installation. Install to allow maximum thickness at all areas.

3. Installation of duct liner board shall conform to manufacturer's recommendation (e.g., 0/C Bulletin A6, 1-MS-3557-E.)

4. Exposed insulated ducts shall be provided with a finish suitable for a final coat of paint. Concealed insulation will not be painted.

3.03 TESTS

A. Insulation shall not be completely installed until pressure/leak tests of piping and ductwork systems have been completed. Straight lengths of pipe may be installed before pressure testing. Verify with ductwork contractor that ductwork integrity has been verified prior to insulating ductwork.

END OF SECTION

SECTION 22 10 00
PLUMBING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The plumbing work includes, but is not necessarily limited to:
   1. Work summarized in Section 22 00 00, Mechanical and Plumbing Scope of Work.

B. Related Work Described Elsewhere:
   1. Section 22 02 00: Piping Pressure Test Report
   2. Section 22 01 00: General Conditions
   3. Section 22 07 00: Insulation
   4. Division 33: Utilities

1.02 QUALITY ASSURANCE

A. Qualifications of Workers:
   1. Use a sufficient number of journeyman plumbers and competent supervisors in the execution of this portion of the Work to ensure proper and adequate installation of plumbing throughout and inside building.

B. Compliance with Specifications:
   1. Whenever required during progress of the work, and after completion of construction, immediately furnish proof acceptable to the Architect/Engineer that all items of plumbing installed equal or exceed all requirements specified for this work.
   2. In the event that such proof is not available or is not acceptable, the Architect/Engineer may require the Contractor to remove the item or items and replace with material meeting the specified requirements and to repair all damage caused in the removal and replacement, all at no additional cost to the Owner.

C. Codes and Standards:
   1. Comply with all Wisconsin Administrative Code and local requirements.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Within fifteen working days after award of contract, and before any plumbing materials are delivered to the job site, submit shop drawings in accordance with the provisions of Division 1 of the General Requirements showing all the plumbing system and plumbing materials, products proposed to be furnished and installed.

B. Construction Record "As-Built" Drawings:
   1. During progress of the work maintain an accurate record of all changes made in the plumbing installation from the layout and materials shown on the approved shop drawings. The location of shutoff valves for the various services and proper identification of services must be shown.

1.04 PRODUCT HANDLING

A. Protection:
   1. Use all means necessary to protect plumbing materials before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements:
   1. In the event of damage caused by this Contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer all at no additional

cost to the Owner.

PART 2 - PRODUCTS

2.01 PIPE

A. Sanitary Drainage:

1. Interior: Domestic waste, vent drain piping shall be standard weight cast iron hub or no-hub soil pipe and fittings meeting ASTM C564 with neoprene push-on or no-hub joints, or Schedule 40 PVC ASTM D2665 solvent welded plastic pipe and fittings. PVC solvents and cements must meet low VOC requirements.

B. Potable Water Piping (Hot/Cold):

1. Potable water piping underground through 3-inch shall be ASTM B-88 type K soft copper meeting AWWA specifications, with bronze compression fittings, or for exterior use only, NSF rated cross-linked polyethylene 160 psi AWWA approved water service pipe. Piping larger than three-inches shall be ductile cast iron push-on joint equal to Clow F-172D meeting ANSI A21.51, class 52. Fittings shall be 250 lb. push-on joint meeting ANSI A21.20 with ANSI 21.11 gaskets. Mechanical joint anchoring fittings may be used in lieu of thrust blocks and tie-rods per UL-FM requirements. Pipe and fittings shall be cement mortar lined per ANSI A21.4 and shall be coated with a bituminous coating of either coal tar or asphalt one mil thick. Brass wedges shall be used where applicable.
2. Potable water piping aboveground through 3-inch shall be hard drawn copper tube type L copper meeting ASTM B-88 with wrought or forged copper fittings and lead free solder.

C. Condensate Drain Piping:

1. Condensate drain piping shall be equal to piping specified for potable water piping above ground or schedule 40 PVC, ASTM D2665.

2.02 VALVES

A. All gate, globe, check and ball valves shall be Milwaukee, Nibco, or Hammond as listed below, or other approved equal. Shutoff valves for general service purposes shall be ball valves, not gate valves. Valves used in potable water service shall not be capable of placing dissolved lead into the potable water stream.

TYPE	SIZE RANGE	VALVE NUMBER		
		Milwaukee	Nibco	Hammond
Gate (screwed)	2" and below	1151	T134	IB629
Gate (sweat)	2" and below	1169	S134	IB648
Gate (flanged)	Above 2"	F-2885A	F617-O	IR1140
Globe (screwed)	2" and below	590T	T235-Y	IB413T
Globe (sweat)	2" and below	1590T	S235-Y	IB423
Globe (flanged)	Above 2"	F-2981A	S718-B	IR116
Swing Check (screwed)	2" and below	510T	T433Y	IB946
Swing Check (sweat)	2" and below	1510T	S433Y	IB945
Swing Check (flanged)	Above 2"	F-2974A	F918-B	IR1124
Ball Valve (threaded)	2" and below	BA-100	T-585-70	8501
Ball Valve (sweat)	2" and below	BA-150	S-585-70	8511

2.03 PIPE SLEEVES AND ESCUTCHEONS

A. Provide sleeves for all plumbing passing through walls, floors, ceilings and partitions. Sleeves shall be 18 gage galvanized steel, or where permitted by code, PVC schedule 40 is acceptable. Pipes passing through walls below grade shall utilize Clow F1429 or equal U.S. Pipe mechanical joint wall sleeve. Sleeves shall be caulked watertight with mastic or applicable silicone sealant. Sleeves passing through fire-rated structures shall maintain that fire rating. Conceal pipe sleeves in finished areas with chrome plated escutcheons.

2.04 HANGERS, ANCHORS AND SUPPORTS

A. Hangers and supports shall be Unistrut, Fee and Mason, Michigan Hanger, or Grinnell Company and suitable for size and type of pipe to be supported.

B. No piping shall be hung from the piping of other trades or systems. Hangers shall be same material as the piping such that neither the hanger nor suspended piping is subject to electrolytic decay.

C. Piping two-inch and smaller may be supported with hook plates wherever it runs adjacent to a side wall. Piping larger than two-inch shall be supported by a wall bracket and either a clevis or roller type hanger.

D. Special pipe materials (e.g., plastics) shall be supported per manufacturer recommendation.

E. The following is a schedule of maximum spacing for hangers and supports and size of suspension rods for all steel and copper piping unless otherwise indicated or required. Rods shall meet ASTM A 575.

PIPE SIZE	ROD DIAMETER	MAX. SPACING
up to 1-1/4"	3/8"	6'-0"
1-1/2" to 2"	3/8"	9'-0"
2-1/2" to 3"	1/2"	11'-0"
4" to 5"	5/8"	14'-0"
6"	3/4"	17'-0"

F. Drainage piping support shall meet requirements of respective pipe manufacturer and local codes.

G. Locate hanger supports and accessories to support pipe lines, valves, joints, and additional concentrated loads. Hangers shall not restrict free thermal expansion unless otherwise shown.

H. Hangers on insulated piping systems shall be oversized to accommodate insulation thickness indicated in Insulation Specification Section 22 07 00. Provide pipe covering protection saddles for applicable insulated piping as also specified in Section 22 07 00, equal to Grinnell Fig. 167.

2.05 VENT FLASHING, SIZING, AND SLOPE

A. Vent stack installation shall be coordinated with Architectural Chimneys. Grade horizontal vent lines one-eighth-inch per foot, minimum.

2.06 VACUUM BREAKERS, CHECK VALVES, AND BACKFLOW PREVENTERS

A. Provide approved vacuum breakers, check valves, and backflow preventers as required by applicable plumbing codes at all possible cross-connections. This applies to any location where a hose connection is possible such as wall hydrants, hose bibbs, and service sinks. Comply with local health department requirements.

2.07 ELECTROLYTIC ISOLATION

A. Isolate all dissimilar piping materials with insulating couplings equal to V-line, Walter Valet, Stockham, or Viking.

2.08 ACCESS DOORS

A. Provide access doors by Milcor, Babcock-Davis, Bilco, Cessco, or American Hatch where valves, traps, and other items needing access are concealed and must be serviced, operated, or maintained. Access doors shall match adjacent finish and shall be equipped with Allen key device for locking purposes.

2.09 PLUMBING FIXTURES

A. General:

1. Furnish fixtures of Class "A" vitreous china or acid resisting porcelain enameled cast iron as specified. Fixtures shall be unmarked, clean, smooth, bright, and guaranteed not to crack, discolor, scale, or craze.
2. Fixtures shall be caulked to floors and walls in compliance with Technical Specification Section 07 92 00 Sealants.
3. All fixtures shall be white unless otherwise specified.
4. No materials may be used which will place dissolved lead into the potable water stream.
5. Provide shutoff valves or stops at all fixtures. Use ball valves, not gate valves, as shutoff valves.

2.10 OTHER MATERIALS

A. All other materials not specifically described but required for a complete and proper installation shall be new, first quality of their respective kinds, and subject to the approval of the Architect/Engineer.

2.11 BOTTLE FILLER FAUCET SCHEDULE

A. Bottle filler faucet: BF-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:

1. 350-CP: Chicago Faucet, Inc
   a. Deck Mounted Single Hole Single Supply Sink Faucet
   b. 5 1/4" Rigid / Swing Gooseneck Spout
   c. 2.2 GPM (8.3 L/min) Aerator
   d. 2 3/8" Lever Handle
   e. Quaturn Compression Operating Cartridge
   f. 1/2" NPSM Supply Inlet with Coupling Nut for 3/8" or 1/2" Flexible Riser
   g. Rated Operating Pressure: 20-125 PSI
   h. Rated Operating Temperature: 40-140°F
   i. Finish: Polished Chrome
2. Equal products by T & S Brass, Moen, or American Standard are acceptable substitutes.

2.12 ELECTRIC WATER COOLER SCHEDULE

A. Accessible Combination Electric Water Cooler and Bottle Filler: EWC-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Model LZSTL8WSLK; Elkay Manufacturing Co.

i. Unit shall be leadfree design which meets Safe Drinking Water Act and is certified to NSF/ANSI 61 and California AB1953. Unit shall be certified to UL399 and CAN/CSA 22.2 No. 120

2. Fixture Type: Combination Water Cooler and Bottle Filler
   a. No. of Bubblers or Stations: Two.
   b. No. Bottle fillers: One
3. Drinking Fountain Unit Capacity: 8.0 gallons per hour, 90 deg F ambient to 50 deg F.
4. Bottle Filler Unit shall include an electronic sensor for no-touch activation with an automatic 30-second shut-off timer. Shall provide 1.1-1.5* gpm flow rate with laminar flow to minimize splashing. Shall include antimicrobial protected plastic components to prevent mold and mildew
5. Fixture Electrical Service: 120 Volts, 60 Hertz, 3.0 to 5.1 Full Load Amps, 244 to 455 rated Watts, 1/6 to 1/5 Horsepower Compressor. Include part no. 36292C receptacle adapter plug.
6. Fixture Cabinet Material: Vinyl-covered steel.
7. Fixture Color or Finish: Manufacturer Standard Grey/Beige.
8. Fixture Mounting: Wall.
9. Supply: 3/8-inch NPS (DN10) copper tubing with ball valve and strainer, include dielectric coupling.
10. Water Filter: WaterSentry® Plus 3000 filter, certified to NSF/ANSI 42 and 53 for lead reduction, with visual monitor to indicate when replacement is necessary.
11. Include: 3 additional 3 pk cartridges part no. 51300C_3PK
12. Plastic Trap: 1-1/2-by-1-1/4-inch NPS (DN40 by DN32) plastic trap, with slip-joint inlet, 1-1/2-inch NPS (DN40) pipe nipple to wall, and wall flange.
13. Supply Insulation Kit: Molded, soft-plastic covering for supply from wall to fixture, including removable covering for stop and handle. Include manufacturer's standard fasteners, straps, and adhesives.
14. Drain Insulation Kit: Molded, soft-plastic covering for drain piping from fixture to wall. Include manufacturer's standard fasteners, straps, and adhesives.
15. Fixture Support: Wall reinforcement is the Plumbing Contractor's responsibility.

2.13 FLOOR CLEANOUT SCHEDULE

A. Floor Cleanout FCO-1 shall be equal to Josam Series 56040-1/56050-1, Jay R. Smith 4100/4111 Series, or Zurn ZN-1400 Level-trol, adjustable floor cleanout, cast iron body with anchor flange, gas and watertight ABS tapered thread plug, and round scoriated nickel bronze top adjustable to finished floor.

2.14 FLOOR-DRAIN SCHEDULE

A. Floor Drain FD-1: Where plumbing specialties of this designation are indicated, provide products complying with the following:
   1. Applicable Standard: ASME A112.21.1M.
   2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. 30000-A Series; Josam Co.
      b. Figure 2005 with A-strainer; Smith: Jay R. Smith Mfg. Co.
      c. 1100STD; Tyler Pipe, Wade Div.
      d. Z-415 with "Type H" strainer; Zurn Industries, Inc., Hydromechanics Div.
   3. Duty: Light Duty.
   4. Body Material: Cast Iron.
   5. Seepage Flange: Required.
   6. Membrane Clamp: Required.

7. Outlet: Bottom.
8. Sediment Bucket: Not required.
9. Top of Body and Strainer Finish: Nickel brass or nickel bronze.
10. Top Shape: Round.
11. Top Dimensions: 6" diameter.
12. Pipe Outlet Size: As indicated on the Construction Drawings.

2.15 EMERGENCY EYE WASH AND SHOWER SCHEDULE

1. Emergency Eye Wash and Shower EEWS-1 shall be equal to Bradley Model S19314 Series quick-access emergency eye/face wash and shower.
2. Features:
   a. Soft-flow dual sprayheads for flooding large areas as well as eyes only.
   b. Self-coiling hose retracts for easy storage while allowing instant extension in emergency situations and Watts 9 D backflow preventer
   c. Water flows when handle is squeezed.
   d. Hand-held hose sprayhead contains an antimicrobial agent to protect the sprayhead. Supplied by an integral 4.8 gpm flow control.
   e. Stay-open Shower and Eye Wash chrome plated brass ball valve
   f. Plastic shower head
   g. 304 SS Bowl with plastic dust cover
   h. Wall bracket
   i. Unit shall meet the ANSI Z358.1 Standard for Emergency Eyewash and Shower Equipment.
   j. Unit shall include features to meet barrier free ADA standards,
   k. Anti scald valve
   l. Pipe Materials shall be NPT, Yellow BradTect Galvanized Steel.

2.16 EMERGENCY FIXTURE THERMOSTATIC MIXING VALVE SCHEDULE

A. Thermostatic Mixing Valve TMV-1: Where plumbing fixtures of this designation are indicated provide products complying with the following:
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. S19-2200 Bradley Inc.
      a. Meets ANSI Standard Z358.1-2009
      b. Maximum operating temperature; 180° F
      c. Maximum operating pressure: 125 PSI
      d. Recommended Inlet Temperature Range: 120° F - 140° F
      e. Temperature Range: Set Point 95° F

2.17 HOSE BIBBS SCHEDULE

A. Hose Bibb HB-1: Where plumbing fixtures of this designation are indicated provide products complying with the following
   1. Woodford model 24 P ¾" NPT with integral vacuum breaker: Chrome Finish: Mounted tight to wall

2.18 LAVATORY SCHEDULE

A. Lavatory LAV-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:
   1. Available Products: Subject to compliance with requirements, products that may be

incorporated into the Work include, but are not limited to, the following:

2. Lavatory: Solid surface counter top with integral bowl by General Contractor.
3. Faucet, ADA Compliant:
   a. Z6915-CWB: Zurn Industries, Inc.
   b. Approved equal.
4. Fitting Insulation Kit:
   a. IK/IW7 Series; Engineered Brass Co., Inc.
   b. PRO WRAP PW 2000 Series; McGuire Manufacturing Co., Inc.
5. Fixture Faucet-Hole Spacing: Coordinate hole spacing with General Contractor.
6. Faucet Construction: Without pop-up waste.
7. Faucet Valve Operation: Hardwired electronic sensor faucet with an integral four inch cover plate.
8. Faucet Mounting Position: Centered on fixture deck.
9. Faucet Components: Include the following:
   a. Accessible-Fixture Operation: Electronic Sensor.
   b. Spout: Integral with body.
   c. Spout Outlet: Manufacturer Standard.
   d. Finish: Polished chrome.
10. Thermostatic Mixing Valve: Provide Watts USG-B-QC-M2 thermostatic mixing valve, forged brass body, meeting ASSE 1016, capable of accurate control of mixed water in plus or minus 3°F up to 120°F. Temperature set at 110° F
11. Check Valves: Install on both hot and cold supplies upstream of thermostatic mixing valve
12. Supply Inlets: 1/2-inch NPS (DN15) copper tubing.
13. Supply Stops: Manufacturer's standard brass, angle or straight, compression, wheel-handle type, same size as supply inlet and with outlet matching supply riser.
14. Supply Risers: 3/8-inch NPS (DN10) rigid with knob-end tailpiece.
15. Drain: Grid strainer with 1-1/4-inch NPS (DN32) offset waste.
16. Tubular Trap: 1-1/2-by-1-1/4-inch NPS (DN40 by DN32), 0.045-inch (1.1-mm) wall thickness, tubular brass, with slip-joint inlet and wall flange.
17. Supply Insulation Kit: Molded, soft-plastic covering for supplies from wall to fixture with removable covering for stops and handles. Include manufacturer's standard fasteners, straps, and adhesives.
18. Drain Insulation Kit: Molded, soft-plastic covering for drain piping from fixture to wall. Include manufacturer's standard fasteners, straps, and adhesives.

2.19 SENSOR PRODUCT ACCESSORIES SCHEDULE

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Hardwire power converter to power up to 10 sensor urinal/closet flush valves or up to eight hardwired sensor faucets. Converter is mounted on a 4-11/16" x 4-11/16" cover plate that mounts to a standard 4-11/16" x 4-11/16" electrical box (supplied by others). To be installed by Electrical Contractor.
   a. P6000-HW6: Zurn Industries, Inc.
   b. Approved equal compatible with sensor products provided.
2. Mini Junction Box is a 4-1/4" x 5" x 1-3/4" [108 mm x 127 mm x 44 mm] electrical enclosure designed to connect up to eight sensor urinals/closets. The unit includes a high impact plastic enclosure with polarity marked terminal board, high impact plastic cover panel, wall mounting tabs, integral strain relief, and illustrative wiring diagram.

To be installed by Electrical Contractor.

a. P6000-MJ: Zurn Industries, Inc.

b. Approved equal compatible with sensor products provided.

2.20 SINK SCHEDULE

A. Sink S-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:

1. Available Products: Products that may be incorporated into the Work include, but are not limited to, the following (products not listed must be approved prior to bid):
2. 18 gage Stainless-Steel Sink:
   a. Lustertone LRQ-3322; Elkay Manufacturing Co.
3. Faucets:
   a. Corolais K-15173-FL: Kohler Inc.
   b. Beverage Faucet K6665: Kohler Manufacturing Co.
   c. Finish: Polished Chrome
4. Fixture Dimensions: Two Compartment, 33 x 22 inches overall,
5. Fixture Faucet-Hole Spacing: 5 holes, Center with 2 holes spaced at 4" on center to left and right of center
6. Fixture Mounting: Counter, self-rimming.
7. Faucet Construction: Cast-brass underbody with brass escutcheon.
8. Faucet Mounting: Centered on fixture deck.
9. Faucet Components: Include the following:
   a. Accessible-Fixture Operation: Manual.
   b. Handles: Single lever handle.
   c. Spray: Chrome Plated.
   d. Spout: Integral with body.
   e. Spout Length: Manufacturer's standard.
   f. Spout Outlet: 0.5 GPM aerator.
10. Air Gap Fitting: Chrome plated
11. Supply Inlets: 1/2-inch NPS (DN15), brass pipe or copper tubing.
12. Supply Stops: Brass, angle or straight, compression, wheel-handle type, same size as supply inlet and with outlet matching supply riser.
13. Supply Risers: 3/8-inch NPS (DN10) rigid with knob-end tailpiece.
14. Drain: 3-1/2-inch (89-mm) removable, stainless-steel crumb cup with 1-1/2-inch NPS (DN40) tubular stainless-steel tailpiece.
15. Tubular Trap: 1-1/2-inch NPS (DN40), 0.045-inch (1.1-mm) wall thickness, tubular brass, with slip-joint inlet and wall flange.
16. Supply Insulation Kit: Molded, soft-plastic covering for supplies from wall to fixture with removable covering for stops and handles. Include manufacturer's standard fasteners, straps, and adhesives.

2.21 GARBAGE DISPOSER

A. Garbage Disposer GD-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:

1. Available Products: Products that may be incorporated into the Work include, but are not limited to, the following (products not listed must be approved prior to bid):
   a. Insinkerator Evolution Series ¾ HP 120 VAC 60 HZ1725 RPM 8.1 AMP Avg. with Stainless Steel Grind Chamber and Components and 6 year warranty

2.22 URINAL SCHEDULE

A. Urinal UR-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Vitreous-China Urinal:
   a. Z5792; Zurn Industries, Inc.
   b. Approved equal.
3. Flushometer Valve:
   a. ZEMS6003AV-ULF-IS-YK; Zurn Industries, Inc.
   b. Approved equal.
4. Fixture Color: White.
5. Type and Operation: Washdown.
6. Mounting and Outlet: Floor mount, floor outlet.
7. Design Water Consumption: 0.125 gal. (0.473 L) per flushing cycle.
8. Flushometer Valve: Exposed Hardwired Automatic Sensor Flush Valve for 3/4" Urinals. Chloramine resistant, dual seal diaphragm with a clog resistant bypass. The valve incorporates a 6 VDC motorized actuator, an integral infrared convergence-type proximity sensor and a manual push-button override into an all-metal, polished chrome plated housing. Sensor automatically adjusts to its environment at power up and is powered by a 6 VDC power converter. The valve is complete with a high back pressure vacuum breaker, one piece hex coupling nut, adjustable tailpiece, spud coupling and flange for top spud connection. Control stop has internal siphon-guard protection, vandal resistant stop cap, sweat solder kit and a cast wall flange with set screw. Internal seals are made of chorramine resistant materials.
9. Flushometer Valve Finish: Polished, chrome-plated, exposed metal parts.

2.23 WATER CLOSET SCHEDULE

A. Water Closet WC-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Vitreous-China Water Closet:
   a. Z5655-BWL; Zurn Industries, Inc.
   b. Approved equal.
3. Flushometer Valve:
   a. ZEMS6000PL-HET-IS-YK; Zurn Industries, Inc.
   b. Approved equal.
4. Toilet Seat:
   a. American Standard, Inc.
   b. Bemis Mfg. Co.
   c. Church Seat Co.
   d. Eljer Industries.
   e. Kohler Co.
   f. Olsonite Corp.
   g. Sperzel.
5. Fixture Color: White.
6. Bowl Type and Operation: Top spud, elongated, siphon jet.
7. Mounting and Outlet: Floor mounted, floor outlet.

8. Fixture Bolt Caps: White, plastic or china.
9. Design Water Consumption: 1.28 gal. (4.9 L) per flushing cycle.
10. Flushometer Valve: Exposed Hardwired Automatic Sensor Flush Valve for 1.1/2" water closets. Chloramine resistant, dual seal diaphragm with a clog resistant bypass. The valve incorporates a 7.6 VDC motorized actuator, an integral infrared convergence-type proximity sensor and a manual push-button override into an all-metal, polished chrome plated housing. Sensor automatically adjusts to its environment at power up and is powered by a 7.6 VDC power converter. The valve is complete with a high back pressure vacuum breaker, one piece hex coupling nut, adjustable tailpiece, spud coupling and flange for top spud connection. Control stop has internal siphon-guard protection, vandal resistant stop cap, sweat solder kit and a cast wall flange with set screw. Internal seals are made of chorramine resistant materials.
11. Flushometer Valve Finish: Polished, chrome-plated, exposed metal parts.
12. Toilet Seat: Solid-plastic, water-closet seat with bumpers and hardware, compatible with water closet and as follows:
    a. Color: White.
    b. Class: Commercial, Standard.
    c. Size: Elongated.
    d. Pattern: Open front without cover.
    e. Hinge Type: Self-sustaining check (SC).

B. Water Closet WC-2: Where plumbing fixtures of this designation are indicated, provide products complying with the following:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. ADA Accessible Vitreous-China Water Closet:
    a. Z5665-BWL; Zurn Industries, Inc.
    b. Approved equal.
3. Flushometer Valve:
    a. ZEMS6000PL-HET-IS-YK; Zurn Industries, Inc.
    b. Approved equal.
4. Toilet Seat:
    a. American Standard, Inc.
    b. Bemis Mfg. Co.
    c. Church Seat Co.
    d. Eljer Industries.
    e. Kohler Co.
    f. Olsonite Corp.
    g. Sperzel.
5. Fixture Color: White.
6. Bowl Type and Operation: Top spud, elongated, siphon jet.
7. Mounting and Outlet: ADA height floor mounted, floor outlet.
8. Fixture Bolt Caps: White, plastic or china.
9. Design Water Consumption: 1.28 gal. (4.9 L) per flushing cycle.
10. Flushometer Valve: Exposed Hardwired Automatic Sensor Flush Valve for 1.1/2" water closets. Chloramine resistant, dual seal diaphragm with a clog resistant bypass. The valve incorporates a 7.6 VDC motorized actuator, an integral infrared convergence-type proximity sensor and a manual push-button override into an all-metal, polished chrome plated housing. Sensor automatically adjusts to its

environment at power up and is powered by a 7.6 VDC power converter. The valve is complete with a high back pressure vacuum breaker, one piece hex coupling nut, adjustable tailpiece, spud coupling and flange for top spud connection. Control stop has internal siphon-guard protection, vandal resistant stop cap, sweat solder kit and a cast wall flange with set screw. Internal seals are made of chorramine resistant materials.

11. Flushometer Valve Finish: Polished, chrome-plated, exposed metal parts.
12. Toilet Seat: Solid-plastic, water-closet seat with bumpers and hardware, compatible with water closet and as follows:
    a. Color: White.
    b. Class: Commercial, Standard.
    c. Size: Elongated.
    d. Pattern: Open front without cover.
    e. Hinge Type: Self-sustaining check (SC).

2.24 WATER FEATURE PUMP

A. Water Feature Pump WFP-1 shall be equal to Laguna Power Jet 400.
   1. Power Requirements 120 VAC 60 HZ 19 Watts
   2. Capacity: 383 GPH @ 5.7' TDH

2.25 WALL CLEANOUT SCHEDULE

A. Wall Cleanout, finished WCO-1 shall be equal to Josam Series 58890, Jay R. Smith Fig. 4472 or Zurn model Z-1468 access cover and plug, round stainless steel wall access cover complete with securing screw and slotted or raised head bronze plug.

2.26 WATER FILTER SCHEDULE

A. Water Closet WF-1: Where plumbing fixtures of this designation are indicated, provide products complying with the following:
   1. DP190 Cartridge Type Water Filter: 3M™ Water Filtration Products

2.27 WATER HAMMER ARRESTER SCHEDULE

A. Water Hammer Arrester WHA-X shall be Sioux Chief Hydra-Rester, Watts No. 15, Precision Plumbing Products SC Series, or equivalent. Water shock absorbers are constructed of seamless hard drawn or rolled type L copper with dual or triple O-ring piston, FDA approved #111 Silicone sealant, ASSE 1010 certified. Selection and location shall be in accordance with Plumbing and Drainage Institute Standard PDI-WH201, and where located on the Construction Drawings.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. General:
   1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies:
   1. In the event of discrepancy, immediately notify the Architect/Engineer.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PLUMBING SYSTEM LAYOUT

A. General:

1. Layout the plumbing system in careful coordination with the approved shop drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactory functioning system.
2. Follow the general layout shown on the approved shop drawings in all cases except where other work may interfere.

B. Enclosure of Pipes:

1. Except where specifically permitted by the Architect/Engineer, lay out all pipes to fall within partition, ceiling, or roof cavities and to not require furring other than that shown on the approved shop drawings.

3.03 TRENCHING AND BACKFILLING

A. Perform all trenching and backfilling associated with the plumbing installation in strict accordance with provisions of Division 31 of these specifications.

3.04 EXISTING SERVICES

A. Where existing sewers, piping, gas, electric or other services are encountered in areas in which their presence was unknown by best available information, including information from local utility companies, each affected Contractor shall take adequate steps to protect such services.

B. If such existing services require relocation, make written request for ruling from the Architect/Engineer. Do not proceed on such portions of the work until written instructions are received.

C. Inactive services shall be plugged, capped or removed. Notify utility companies, municipal agencies having jurisdiction and the Architect/Engineer. Protect or remove as directed.

3.05 INSTALLATION OF PIPING AND EQUIPMENT

A. General:

1. Install all piping, promptly capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Provide uniform pitch of 1/4" per foot when possible and 1/8" per foot minimum for all horizontal waste and soil piping within the building. Pitch all vents for proper drainage.
3. Cushion all straps and bearings to minimize transfer of sound. Firmly anchor all pipes in position. Provide complete isolation of dissimilar metals.
4. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Promptly remove all defective material from the job site.
5. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect/Engineer.
6. Locate all vent pipe discharges in accordance with plumbing and mechanical codes having jurisdiction relative to distances from air intakes, windows, and other situations where their presence constitutes a hazard. Generally at least ten feet horizontal distance from or three feet vertical distance above air intakes is required.

B. Joints and Connections:

1. Threaded Joints: Joints in threaded piping shall be made with graphite and oil joint compound, or specified lubricant, applied to the male thread only. Care shall be used to keep the inside of the pipe clean from joint compound, cuttings, scale and other

foreign material. Pipe shall be reamed full size. Leaking joints shall be repaired by replacement with new threaded materials.

2. Welded Joints:
   a. Where welding is called for, it shall be of the fusion process and shall consist of welding by means of either the oxy-acetylene or electric arc process.
   b. All welding shall conform to the ASME Code for Power Boilers, or the ANSI code for Pressure Piping (latest edition).
   c. The connections to a welded pipe 2" and larger shall be made with a welding tee or Weld-0-Let of butt, socket, or threaded type as required.
   d. Only welding ells may be used for changing pipe directions of welded pipe lines. Mitered joints will not be permitted.
3. Where PVC pipe is used, joints shall be made by solvent cementing method, performed in strict accordance with manufacturer's written instructions except where other types of joints are shown or specified.
4. Pack all joints in cast iron soil and waste pipe and fittings, using approved material and method, securing fully and properly caulked and smoothly finished, except where compression-type neoprene or no-hub fittings are permitted and used.
5. Make all aboveground joints in copper tube with lead-free solder applied in strict accordance with the manufacturer's recommendations.

3.06 INSTALLATION OF VALVES

A. Gate and globe valves shall not be installed with stem below the horizontal.

B. Gate or ball valves shall be provided in all main branches of the piping and where necessary to dismantle, drain, and repair the systems.

3.07 INSTALLATION OF PLUMBING FIXTURES

A. The rims, fronts and all exposed parts of lavatories, service sinks, water closets, drinking fountains and other fixtures shall be covered and protected with suitable guards and building paper until completion of the work. This protection is to be installed immediately at the time of setting plumbing fixtures and to be removed only when the completed project is turned over to the Owner.

B. All fixtures shall be sealed gas and watertight at walls and floors in accordance with manufacturer's recommendation. Manufacturer's recommended hold down bolts shall be used and shall be equipped with nuts and washers.

C. Roughing in dimensions shall be determined only from fixture brochures approved by the Architect/Engineer.

D. Mounting of fixtures shall meet ADA accessibility guideline requirements where applicable.

3.08 INSTALLATION OF UNDERGROUND PIPING

A. Sewer Pipe:
   1. The trench shall be dry during the pipe laying operation. If dewatering is needed, it shall be this contractor's responsibility. The trench bottom shall be prepared as previously specified. Bell holes shall be excavated to that after placement, the barrel of the pipe will have full hearing on the trench bottom.
   2. Pipe shall be protected during handling against impact shocks and free fall.
   3. The laying of the pipe shall commence at the outlet and proceed up grade with spigot ends pointing in the direction of flow.
   4. The socket of the pipe last laid shall be wiped clean and the spigot end of the pipe to be laid shall then be centered and pushed home against the base of the socket. The pipe shall be centered so that they will form a sewer with a uniform invert. The joints shall be made as previously described.

5. All pipe shall be laid to the line and grade called for on the plans or minimum slope necessary to satisfy plumbing code. Each pipe, as laid, shall be checked the contractor with a suitable sighting level beam to insure that this result is obtained.
6. After the pipe is laid, sharp sand or fine gravel shall be carefully deposited along the sides of the pipe. Backfill shall be carefully tamped under the haunches of the pipe. Care shall be taken during backfilling and tamping so that the line and grade of the pipe are not disturbed. Any pipe found off grade or out of line shall be re-laid properly by the contractor. Additional sand, gravel or stone shall then be placed until the entire width of the trench is filled to not less than one foot above the top of the pipe. If sand is used for back fill around the pipe, it shall be thoroughly compacted with a vibratory compactor; hand compaction will not be acceptable. The remainder of the backfilling may be done in the manner presented elsewhere in these specifications.
7. Minimum cover for exterior piping shall be six feet unless otherwise specified. Interior piping shall have a minimum distance of six-inches from top-of-pipe to bottom-of-floor slab.

3.09 CLEANING SANITARY SEWERS

A. Verification: Prior to putting systems into use and before the sewer is tested thoroughly flush the sewers and verify that all new and existing sanitary sewers are free of construction debris. If this simple flushing procedure does not readily verify the piping is intact and clean, the sewer shall be cleaned as follows:

B. The Contractor shall furnish an inflatable rubber ball of a size that will inflate to fit snugly into the sewer to be tested. The ball shall be placed in the upstream manhole and water shall be introduced behind it. The ball shall pass through the pipe with only the force of the water propelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted.

C. In the event debris stops the ball, the Contractor shall remove the obstruction by further flushing or cleaning. In the event a damaged pipe stops the ball, the Contractor shall repair the sewer.

D. Cleaning may also be accomplished by the use of a high-pressure water jet.

3.10 CLOSING IN UNINSPECTED WORK

A. General:
   1. Do not cover up or enclose work until it has been properly and completely tested, inspected, and approved.

B. Non-Compliance:
   1. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect/Engineer all at no additional cost to the Owner.

3.11 TESTING

A. General Procedures:
   1. Furnish all required personnel and equipment and make all tests required to receive the approval of the Architect/ Engineer and all agencies having jurisdiction.
   2. Piping shall be tested at a hydrostatic pressure to fifty-percent over the system design pressure or at 125 psig, whichever is greater, except that plumbing fixtures and drainage piping shall be tested according to code requirements. Systems shall have no significant pressure loss for 24 hours. If defects are found, repeat tests after defects have been corrected.
   3. Concealed pipe shall be tested in sections in such a manner that will not leave any pipe or joint untested.

4. Control devices, air vents and other parts not designated to stand pressures used in testing piping shall be removed or otherwise protected before testing the piping systems.
5. Use Piping Pressure Test Report form in Section 22 02 00 for record purposes where applicable.
6. Full payment will not be authorized unless all piping pressure test reports or signed certifications of complete leak free systems are submitted to the Architect/Engineer.

B. Additional Testing Requirements:
1. All fabricated piping shall, as a minimum, meet the examination, inspection and testing requirements of ANSI B31.3.
2. Inspectors representing the Owner shall have access at all times while work on their contract is being performed to all sections of the worksite that concern the fabrication and erection of the piping on their contract. The inspectors shall be afforded all reasonable facilities to satisfy them that the work is being performed in accordance with the requirements of applicable specifications and procedures.
3. All welding performed under this specification shall be subject to visual inspection. This visual inspection shall include an examination of joint details prior to welding, inspection for defects during welding and for defects, undercut, overlay and reinforcement dimensions after welding.
4. As far as is practicable, all pressure tests shall be complete system tests conducted in the presence of Architect/Engineer representative. All pressure vessels, instruments and equipment connected to the piping shall be excluded from the tests.
5. Every precaution shall be taken during testing to insure the safety of the operator. Systems to be pressurized will be provided with appropriate gages and pressure relieving devices.
6. All joints, including welds, are to be left un-insulated, unpainted, and exposed for examination during testing.
7. Equipment which is not to be subjected to the pressure test shall be either disconnected from the piping or isolated by blinds or other means during the test. Valves may be used provided that the valve is suitable for the proposed test pressure.
8. Expansion joints shall be provided with temporary restraint, if required, for the additional pressure load under test, or shall be isolated from the test.
9. Pressure relief and thermal relief valves shall be excluded from these tests.
10. Before every test the piping systems shall be visually inspected to assure that there are not visual defects and that all connections are tight.
11. Control valves, unless being tested, shall be set and maintained in the wide open position.
12. Lines that are spring or counterweight supported and all vapor or gas lines shall be temporarily supported during test in order to support the test fluid load, if necessary.
13. Lines containing check valves shall have the pressure applied upstream of the check valve so that pressure is applied under the seat.
14. All in-line instruments, gage glasses, flow meter pot, liquid level float gages, and all other pressure parts of instruments shall be excluded from these tests.
15. Pneumatic testing of fiberglass reinforced plastic, glass, or plastic piping is not permitted.
16. Joints found to be defective shall be repaired and retested.
17. Retesting of lines after repairs shall be done at pressures originally specified for the test.
18. When pneumatic or hydrostatic tests are not appropriate, tests shall be as specified by the Architect/Engineer.

C. Test Reports: The Contractor shall make a record of the test applied to each piping system, which shall consist of the following data: Note: Full payment will not be authorized unless all piping pressure test reports or signed certifications of complete leak free systems are submitted to the Architect/Engineer.

1. Line designation number.
2. Date of test.
3. Type of test, pressure applied, and length of time at test pressure.
4. Tested by:
5. Comments, if any:
6. Piping Pressure Test Report form in Section 22 02 00 to be completed.

D. Hydrostatic Tests:

1. The hydrostatic test pressure shall be calculated in accordance with applicable section of ANSI B31.3, but shall not exceed the maximum test pressure of any component included in the test.
2. Temperature and head adjustments shall be made in accordance with ANSI B31.3, Paragraphs 337.4.1 and 337.4.2.
3. Hydrostatic test pressures for fiberglass reinforced plastic, glass or plastic pipe, must not exceed manufacturer's recommended working pressure.
4. All hydrostatically tested systems shall be tested to one and one-half times the design pressure or to a minimum pressure of fifty psig, whichever is greater. All test pressures shall be maintained a minimum of ten minutes before visual examination of joints begins.
5. Hydrostatic test pressures shall not be applied until the piping system and the testing medium have reached thermal equilibrium.
6. During the tests, hydrostatic pressures shall be monitored and corrections shall be made to compensate for thermal expansion or contraction. By this procedure the test pressure shall be kept within five psig or one percent, whichever is greater, of its intended value. All joints shall be visually examined for leakage during the test.
7. Tested systems shall be vented and drained immediately upon successful completion of the test. All process and solvent lines shall be dried by passing clean dry oil-free air through them until they are dried to the satisfaction of the Architect/Engineer or the Architect/Engineer representative.
8. No repair welding shall be done on any section of piping that contains water.

E. Pneumatic Tests:

1. Air tests shall be performed with clean, dry, oil-free air, or nitrogen, as required. The source shall be equipped with appropriate pressure relief valves and gages.
2. Air tests shall be performed at a test pressure in accordance with the applicable section of ANSI B31.3. The minimum test pressure shall be fifty psig.
3. Pneumatically tested systems shall include a preliminary check at not more than fifty psig. The system shall then be brought up to test pressure in twenty-five psig increments. Enough time shall be left between steps to allow the system to equalize strains, to inspect for leaks by soap and water method and to allow test media to reach thermal equilibrium.
4. During the test, pressures shall be monitored and corrections shall be made to compensate for thermal expansion or contraction. By this procedure, the test pressure shall be kept within five psig of its intended value.
5. Tested systems shall be vented immediately upon successful completion of the test.
6. No repair welding shall be performed on a pressurized system.
7. Where both hydrostatic and pneumatic tests are run on a section of pipe, the hydrostatic test shall precede the pneumatic.

F. Standing Water Test

1. All portions of the system shall be filled with water.
2. Water shall stand for a period of not less than eight hours.
3. The leak rate shall be as specified by "Sewer Design and Construction" - ACME M&R No. 37. Steel piping systems shall be leak tight.
4. If the system loses water faster than the rate specified, the leaking component shall be repaired and the system retested.

3.12 STERILIZATION OF PIPES

A. General:

1. After preliminary purging of the system, chlorinate the entire potable water system, both site and in building, in accordance with the current recommendations of the American Water Works Association and in accordance with pertinent codes and regulations.
2. Chlorinate when building is unoccupied and before water is used for human consumption. Post signs at all taps stating water is unsafe. Remove signs after chlorination.

B. Flushing:

1. Upon completion of the sterilization, thoroughly flush the entire potable water system.
2. When sterilization and flushing are complete arrange with agencies having jurisdiction for all required tests on mains and systems.
3. Contractor shall repeat chlorination and flushing if tests show water is unsafe until safe levels are verified.

3.13 POTABLE WATER SYSTEM TESTING

A. After completion of the work and prior to owner occupancy, contractor shall utilize the services of an independent testing laboratory to verify that concentrations of dissolved lead in the potable water system meet the guidelines of US EPA and State and local Health Departments.

B. Testing shall include representative sampling from all areas of the building, typically sampling the incoming water, at the end of each major piping supply loop, and at domestic hot water returns to water heater systems. Testing shall sample the first one-half gallon at each location after systems have been idle for at least six hours.

C. If testing indicates levels higher than standards allow, contractor shall take appropriate steps to resolve the problem, typically a series of flushing with very hot water and then retesting.

D. Submit to Architect/Engineer three copies of letters from agencies having jurisdiction documenting the safety and acceptance of the potable water system.

3.14 CLEANING UP

A. Prior to acceptance of the work thoroughly clean all exposed portions of the plumbing installation. Remove all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item, being careful to avoid all damage to finished surfaces.

END OF SECTION

SECTION 23 00 00
HEATING, VENTILATION, & AIR CONDITIONING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Heating, ventilating, and air conditioning required for this work is indicated on the drawings and includes, but is not necessarily limited to:
   a. HVAC work included under HVAC systems in Section 22 00 00 Scope of Work.
   b. Responsibility for operation, startup and guarantee of installed systems and equipment.
   c. All necessary permits and approvals associated with installation of this work.
   d. Provide dampers, if so indicated, under Equipment Specifications.
   e. Install all automatic dampers. Dampers shall be set free of binding. Frames of dampers shall not be used to square duct work and shall be caulked for tight seal. Access doors or panels shall be furnished and installed by sheet metal workers to allow access to automatic control dampers.
   f. Assemble multiple section dampers with required interconnecting linkages, shafts and brackets and extend the required number of shafts through the ducts for externally-mounted damper motors. Jack shafts will be assembled with sealed roller or ball bearings of stainless steel construction.
   g. Dampers, grilles, diffusers, intake ventilators, roof curbs, and other specified items.
   h. Include one set of spare air handling system filters for startup. After operating systems, and balancing airflow, replace with clean filters prior to turning over facility to owner.
   i. Startup and coordination with Testing and Balancing (TAB) Contractor.

B. Related Work Described Elsewhere:

1. Section 22 00 00: Mechanical and Plumbing Scope of Work
2. Section 22 01 00: Mechanical and Plumbing General Provisions
3. Section 22 07 00: Insulation
4. Section 22 10 00: Plumbing
5. Section 23 09 00: Controls & Instrumentation
6. Division 26: Electrical

1.02 QUALITY ASSURANCE

A. Qualifications of Installers:

1. For the actual fabrication, installation, and testing of work under this section, use only thoroughly and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.
2. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of installers.

B. Codes and Standards:

1. In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Duct Construction Standards" 2005 edition, as published by the Sheet Metal and Air Conditioning Contractors Association (SMACNA), on all systems.
2. Comply with NFPA 90A, UL Standard 181, and SMACNA.

3. ASHRAE Handbook, particularly most recent Systems Volume Chapter on Sound and Vibration Control.

1.03 LEED REQUIRMENTS

A. The material, products and methods specified in this section have the potential of contributing to the achievement of this Project's targeted LEED points. The ability ot successfully meet LEED requirements is dependent on the manufacturer, materials and/or methods selected by each contractor. The General Contractor shall verify the contribution of the selected item(s) to the Project's LEED Requirements. The General Contractor shall document this contribution as specified in Division 1 Section"01352-Leed requirements". LEED Requirement's that may be impacted include but are not limited to:

1. Credit MR2.1 and MR2.2: Construction Waste Management: See Division 1 Sections "LEED Requirements" and "Construction Waste Management" for construction waste management requirements.
2. Credit MR 4.1 and MR 4.2: Recycled Content: See Division 1 Section "LEED Requirements" for recycled content requirements.
3. Credit MR 5.1 and MR 5.2: Regional Materials: See Division 1 Section "LEED Requirements" for regional material requirements.
4. Credit EQ 4.1, EQ 4.2, EW 4.3 and EQ 4.4: Low-Emitting Materials: See Division 1 Section "LEED Requirements: for low-emitting material requirements.

1.04 SUBMITTALS

A. General:

1. Comply with provisions of Division 1.

B. Manufacturer's Data:

1. Within 25 calendar days after award of Contract submit:
   a. Complete materials list of all items proposed to be furnished and installed under this Section.
   b. Shop Drawings for each type of overhead sectional door units showing components, arrangements, dimensions, orientation on walls, sections of trim members, insulation resistant values, dimension elevations, grounds, motors, reinforcements, operators and accessories.

C. LEED Submittals:

1. Credit MR4.1 and MR4.2: Product Data indicating percentage by weight of recycled content for products having recycled content.
   a. Indicate quantity each of post-industrial or post-consumer recycled content.
   b. Include statement indicating costs for each product having recycled content.
2. Credit MR 5.1 and MR 5.2: Documentation of manufacturing location and origins of materials for products manufactured within 500 miles of the building site.
3. Credit EQ 4.1, EQ 4.2, EQ 4.3, and EQ 4.4: Documentation for interior adhesives sealants and coatings, carpet systems and composite wood products confirming that the VOC limits conform to limits specified in Division 1 Section "LEED Requirements".

D. Shop Drawings:

1. Within 15 days after award of contract, and before any materials of this section are delivered to the job site, submit complete shop drawings to the Architect/Engineer in accordance with the provisions of Section 01 33 00 of the General Requirements.

E. Materials List:

1. Accompanying the shop drawings, submit a complete list of all materials proposed to be furnished and installed under this section, giving manufacturer's name and catalog

number for each item; this shall in no way be construed as permitting substitution except as specifically provided in Section 01 33 00 of the General Requirements.

F. As-Built Drawings:

1. During progress of the work, maintain an accurate record of all changes made in the system from the layout and materials shown on the approved submittals or plans.

1.05 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacements:

1. In the event of damage caused by this contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. General:

1. All equipment shall be of the capacity and type shown on the equipment schedule in the drawings and shall be as manufactured by one of the manufacturers designated herein or shall be an equal approved in advance by the Architect/Engineer.

B. Single Source:

1. For ease of maintenance and parts replacement, use equipment of a single manufacturer to the maximum extent possible.
2. Indicate on proposal form the equipment manufacturers to be used on this project.

2.02 AIR HANDLING UNITS

1. Units are existing, new flat and bag filters need to be installed when construction begins, all open ductwork needs to be covered per LEED requirements during construction and a final new set of flat and bag filters shall be installed upon completion of construction and handover to owner. Filters shall be checked periodically during construction and if they are in need of replacement the contractor shall replace.

2.03 EXHAUST STACKS

1. On gas-fired unit heaters, breaching shall be type "B" Metalbestos or Hart and Cooley Metivent with inner aluminum liner and outer galvanized steel (or equivalent by AMPCO or Van Packer), with Breidert X-Hauster or Metivent top, sized for actual flue gas rates.
2. The combustion air and vent piping for the unit heaters in the staging area and vestibule area shall be replaced with new. Utilize a corrosion resistant material, install per the manufacturers specifications sealing all joints and insulating once completed.

2.04 VARIABLE AIR VOLUME (VAV) TERMINALS:

A. Factory-assembled, externally powered, pressure independent variable air volume terminal box. Unit shall be complete with volume regulator, flow sensor, duct connection collars, and all required accessories.

B. Control box shall be clearly marked with an identification label with nominal air flow rate, maximum and minimum factory set air flow limits, coil type and coil hand.

C. Unit Cabinet:

1. Constructed of minimum 22 gage galvanized steel box with round, oval or rectangular inlet collar, and rectangular discharge with slip and drive connection. Leakage rate

shall not exceed 1 percent at 125 Pa (0.5 inches water gauge).

2. Cabinet insulation shall be as follows:
   a. Double wall construction with ½" matt faced insulation

D. Volume Regulator (damper):
1. Factory mounted air flow control regulator shall be capable of maintaining constant air flow to within 5 percent of rated flowrate down to 25 percent of unit's nominal flowrate, independent of system static pressure changes.
2. Air flow regulator shall be mounted to a shaft having self-lubricating bearings. Shaft end shall be marked to indicate damper position and shall have a built-in stop to prevent overstroking
3. Damper blade shall close off against gasket to limit leakage to 10 cfm at 6.0 inches of differential static pressure

E. Flow Sensor:
1. Inlet collar of air terminal shall include a cross or ring shaped multi-point flow sensor that shall amplify the measured velocity pressure.

F. Controls:
1. Control Contractor shall provide all required pressure- independent electronic controls compatible with building automation system capable of maintaining required air flow setpoints within 5 percent of unit's capacity of any inlet pressure up to 4 inches water gauge. Controllers shall have capability of resetting between factory or field-set maximum and minimum setpoints to satisfy room thermostat demand.
2. Unit manufacturer shall be responsible for reviewing compatibility of devices (actuators, linkages, pressure transmitters, controllers, etc.) furnished by the Controls Contractor before installation at factory.

G. Reheat Coil:
1. Where indicated on Variable Air Volume (VAV) Unit Schedule on drawings provide reheat coil. Coil shall be mounted in a galvanized steel casing and factory mounted to the control box.
2. Hot water coils shall have same-end connections and have aluminum fins, minimum 10 fins per inch, bonded to minimum ½ inch O.D. copper tubes by mechanical expansion. Coils shall be factory leak tested to 250 psig under water

H. Acceptable Manufacturers:
1. Trane Co.
2. Carnes Co.
3. Nailor
4. Enviro-tec

2.05 DUCTWORK

A. Rectangular Ductwork:
1. Rectangular ductwork shall be constructed to meet all functional criteria defined in Section VII, of the SMACNA "HVAC Duct Construction Standards Metal and Flexible" 1985 (not 1995) Edition (SMACNA Manual), and shall comply with all local, state, and federal code requirements.
2. Ductwall:
   a. All interior ducts shall be constructed with G-60 or better galvanized steel (ASTM A-653/A 653M) LFQ, chem treat.
   b. Support, access doors not part of ducts, bar or angle reinforcing damper rods and items made of uncoated mild steel shall be painted with two coats of primer or provide the galvanized equivalent.
3. Pittsburgh lock shall be used on all longitudinal seams, all of which shall be sealed

with mastic sealant. Snaplock is not acceptable.

4. Flanged interior gaskets:
   a. Use either Ductmate 440 or a butly rubber gasket which meets Mil-C 18969B; Type II Class B, TT-C-1796 A, Type II Class B, and TTS-S-001657 must also pass UL-723. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth associated with dark, damp areas of ductwork. Note that the recommended test procedure for bacterial and fungal growth is found in 21 CFR 177, 1210 closures with sealing gaskets for food containers.
   b. Ductmate or WDCI proprietary duct connection systems will be accepted as long as ducts constructed using these systems comply with their respective manufacturers guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint requirements.
   c. Formed on flanges shall be constructed as SMACNA T-25 flanges (T-25a Lockformer or T-25b Engel TDF) and may only be used within the limits of Page 1.36 of the 1995 (not 1985) SMACNA Manual, Second Edition. They will be accepted only for use on ductwork 42 inches wide or less and must include the use of corners, bolts, and cleat.
5. Rectangular ductwork shall be fabricated, joined, and supported in accordance with SMACNA recommended procedures to meet operating pressure criteria of 4" w.g. maximum pressure upstream of VAV boxes, 2" w.g. maximum pressure for constant volume air handling systems, return ductwork, and downstream of VAV boxes.

B. Round Ductwork:
1. Round ductwork shall be United Sheet Metal Spiral UniSeal Duct manufactured from galvanized steel meeting ASTM A-527-71 and SMACNA 4" pressure requirements, constructed per SMACNA HVAC Duct Construction Standards, Section III, spiral seam construction, gauges and fittings per SMACNA Duct Construction Standard, with following exceptions:
   a. Low pressure straight round ductwork may be used where applicable meeting 2" w.g. SMACNA Standards after VAV boxes or on return or simple exhaust systems, or on small single zone system supply duct (10 tons or less).
   b. With joints 0-20" diameter, use interior slip coupling beaded at center, fastened to duct, with sealing compound applied continuously around joint before assembling and after fastening. Wrap joints with 3 inch wide duct tape.
   c. With joints 21"-72" diameter, use 3 piece, gasketed, flanged joints consisting of 2 internal flanges (with integral mastic sealant) split to accomodate minor differences in duct diameter, and one external closure band designed to compress gasketing between internal flanges, equal to Ductmate Spiralmate.
2. Round fittings shall be United Sheet Metal Uni-Form manufactured from galvanized steel meeting ASTM A-527-71 and SMACNA high pressure requirements with continuous welds. Standing seam fittings meeting these requirements are also acceptable. United McGill SRSCK duct coupling with manufacturer's recommended sheet metal screws and installation requirements may be used in lieu of angle rings.
3. Round ductwork and fittings shall be made by the same manufacturer. If different manufacturers are utilized, the supplier/manufacturer submitting the quote shall guarantee appropriate tolerances between fittings/ductwork and shall make any modifications required to provide proper fitting system.
4. Equal ductwork and fittings by LaPine, Eastern, Dynasonics or Semco may also be used.

C. Flexible Ductwork:
1. Flexible duct for air conditioning shall be factory preinsulated with 3/4 pound density fiberglass sheathed in a vinyl vapor barrier, Class 1 UL rated. Use insulated flexible ductwork rated same as "high" pressure duct immediately ahead of VAV boxes

meeting SMACNA Form M-I, rated at 10 inches W.C. per UL 181. or for 6 inch W.C. positive pressure for 12 inches and under and 4 inches W.C. positive for 14 inches and over, Hart & Cooley F164 (R-4.2) or equal by ATCO or other approved equal. Use "low" pressure duct downstream of VAV boxes, immediately ahead of diffusers meeting SMACNA Form NM-IL, Hart & Cooley F114 (R-4.2), or equal by ATCO or other approved equal. Use of flexible ductwork is restricted to inlet connections to variable airflow boxes, and diffusers, and is limited to three feet in those areas. NOTE: FLEXIBLE DUCTS AND CONNECTORS SHALL BE INSTALLED IN ACCESSIBLE AREAS ONLY AND SHALL NOT BE CONCEALED. BENDS, TURNS, OR SAGGING, ARE NOT ACCEPTED. INSTALLATION OF FLEXIBLE DUCTS AND CONNECTORS SHALL CONFORM TO AIR DIFFUSION COUNCIL "Flexible Duct Performance & Installation Standards" Third Edition, 1996.

2.06 PROPELLER INLINE EXHAUST FANS (EF-3)

A. Fans shall be Cook or Greenheck as listed in the equipment schedule, or equivalent by Acme or Penn. Features shall include:

B. Dynamically balanced, all aluminum propeller blades.

C. Motors and belts shall be provided with safety guards which are easily removed for maintenance.

D. Motorized shutoff damper as scheduled.

E. UL 705 stamp for general use.

2.07 SPLIT SYSTEM HEAT PUMP UNITS

A. Equipment shall be Carrier high efficiency sealed combustion furnaces as indicated on the equipment schedule or approved equal by Trane, York, or Bryant, and shall include the following features:

1. Aluminized steel heat exchanger.
2. Heavy gauge CRS cabinet with interior liners and foil faced fiberglass insulation.
3. 1" thick throwaway air filter.
4. Combustion air intake box containing purge blower and air intake.
5. Automatic 24 volt gas control valve.
6. Wiring and junction box.
7. Fan and limit controls and 24 volt control transformer.
8. Vent/intake air roof/wall termination kit.
9. Condensing unit shall be as indicated in the equipment schedule or equivalent unit to match selected furnace manufacturer.
10. Include pre-charged refrigerant tubing of appropriate size and length. Contractor also has the option of field installation of refrigerant piping system per ARI and ASHRAE guidelines and recommendations.

2.08 FIELD INSTALLED REFRIGERATION PIPING AND ACCESSORIES

A. Refrigeration Specialties:

1. Where not furnished as specified in the equipment schedule, refrigeration specialties shall be incorporated as follows:
   a. Stop valves shall be the packless type with gas tight cap seal, brass with sweat connections and combination hand wheel seal cap, as made by Mueller, Linemaster, Globemaster, or Henry.
   b. Thermostatic Expansion Valves:
      i. Thermostatic expansion valves shall be Sporlan, Alco, Henry or Refrigeration Specialties.

ii. Thermostatic expansion valves shall be installed as near the liquid header as possible in an upright position. Size of expansion valves shall be as recommended by manufacturer or ASHRAE for service and capacity of systems.

c. Solenoid valves:

i. Solenoid valves shall be Alco, Henry, or Refrigeration Specialties.

ii. The valves shall be installed in liquid refrigerant line serving each cooling coil as a primary refrigerant flow control device permitting or stopping flow of refrigerant to automatic expansion valve. Solenoid valves shall be moisture and vapor proof and of corrosion resisting materials, designed for intended service positive opening and closing action.

d. Flexible Vibration Absorbers:

i. Absorbers shall be the corrugated type, non-porous bronze alloy installed on suction and discharge refrigerant lines. Suction vibration eliminators shall be wrapped with vapor barrier tape to present frost formation. Absorber shall be suitable for 300 psi working pressure.

ii. Alternate flexible pipe connectors be Universal or Flexonics and shall have a minimum length of eighteen inches, all bronze construction with braided sleeve, sweat connections and suitable for 300 psig working pressure.

B. Refrigerant Piping:

1. Refrigerant piping shall be seamless copper type "K", conforming to ANSI Standard B9.1 and B31.5.
2. Fittings shall be wrought copper recessed for silver brazed joints.
3. Joints shall be made with a high melting point type silver solder having a melting point greater than 1000ºF.
4. Pre-fabricated, pre-charged piping systems, as made by Aeroquip may also be used.
5. Refrigerant piping from condensing unit shall be run below grade. Piping below ground shall be insulated as specified. Piping below grade shall be installed in PVC pipe or split clay tile to protect refrigerant piping. Note use of 1" thick insulation on suction piping.

C. Valves for refrigerant piping shall be Sporlan or Henry and installed per equipment manufacturer's recommendations.

D. Refrigeration liquid lines shall be installed with strainers, solenoid valves, shut-off valves, dehydrators, liquid indicators and dryers as specified. Sizes of liquid lines not indicated on drawings or in manufacturer's instructions shall be sized in accordance with the latest edition of ASHRAE Guide. Test assembled liquid piping for not less than twice the operating head pressure, unless otherwise specified.

E. Refrigeration suction lines shall be installed with shut-off valves and strainers specified. Sizes of suction lines not indicated on drawings shall be sized in accordance with latest edition of ASHRAE Guide. Total friction for suction lines from any evaporator to compressor manifold shall not exceed a pressure equivalent of two (2) degrees temperature drop from the specified refrigeration suction temperature at evaporator. Double suction risers and trap shall be provided where needed for oil transfer.

F. Extreme care shall be taken to insure maximum cleanliness of all refrigerant piping. Piping shall be dehydrated in an approved manner and system given a dry carbon dioxide or dry nitrogen test and held at 150 pound pressure low side, and 300 psi pressure high side, for period of twelve (12) hours without loss of pressure. Test joints for leaks with soap solution; during test isolate expansion valves and other auxiliary apparatus to prevent damage by high pressure. Pipe covering shall not be installed or piping anchored until testing is complete. The piping shall be tested with a halide torch, including all gauge connections, seals, expansion valve connections, hand valves, and other potential leakage points. In the

event leakage occurs, pipe shall be dismantled and repaired. Repeat the test after defects have been corrected. After completing pressure test, exhaust the system by means of vacuum pump connected to liquid line; after 28 inch vacuum is obtained, close suction and discharge valves at compressors tightly and continue evacuation for 24 hours; check vacuum by mercury column vacuum gauge. After dehydration of system is thus completed, charge system with refrigerant and put into operation. Dryer shall be charged until system is dry. Evacuation shall assure removal of all moisture and non-condensable gases. If at any time during the guarantee period the system loses its charge, the Contractor shall again evacuate and charge in accordance with the above instructions.

2.09 SOUND ATTENUATORS

A. Provide sound attenuators as scheduled to meet the acoustical and airflow performance requirements. Alternative manufacturers shall provide a complete submittal including detailed, project specific system acoustical analysis, and standard test data for the evaluation of the engineer 10 days prior to bid.

B. Provide inert, inorganic fill material that is resistant to mold, mildew, and fungi growth and with surface burning and flame spread characteristics less than 50 and 25 respectively when tested according to ASTM E84.

2.10 FIRE DAMPERS

A. Fire dampers shall be UL approved, NBFU Class B equivalent to Atcor Model NFB-F, Air Balance, Inc., Ruskin, National Control Air or approved equal. Fire dampers shall have a minimum one hour rating and manufacturer shall be on the State Fire Marshal's list of approved manufacturer's. Dampers shall have full duct free area openings and shall not obstruct flow of air. In all cases, fire dampers shall conform to the requirements of NFPA 90A and the State and local fire marshal. Unless otherwise indicated fire dampers shall be selected for dynamic operation. Where special wall or floor construction indicates two, three, or four hour fire separation requirement, fire damper rating shall be increased to match the building construction requirement.

B. Comply with Wisconsin Administrative Code.

C. Where air handling systems or exhaust systems are not shut down upon detection of smoke or fire, fire dampers rated for dynamic use shall be furnished and installed. Damper shall comply with U.L. 555. Dampers shall be selected to meet the fire requirements of the particular architectural fire separation rating. Fire dampers shall be as made by Air Balance Inc., series Model 119 Curtain-type fire damper (or equal by Ruskin) equal to the following description:

1. Where required to have blade curtain out of the airstream (in the open position), furnish and install Model 119BL.
2. For round and oval ductwork, furnish and install Model 119ALU (unsealed) or Model 119ALS (sealed).
3. For high pressure ductwork, furnish and install Model 119CL.
4. Each damper shall be Underwriters Laboratories classified as a 1-1/2 hour rated fire damper in accordance with U.L. Standard 555, for use in fire partitions rated at less than 3 hours, and shall bear a U.L. label verifying this classification and listing.
5. Damper frame shall be one-piece roll-formed 22 ga. galvanized steel, employing double-thickness 3/4" high standing channel legs. Blades shall be roll-formed 22 ga. galvanized steel, and shall be of the interlocking joint curtain design. Frame and blade material coating shall be hot-dipped mill galvanized, in full compliance with U.L. 555 (Sec. 5.1.B.). Blade curtain shall be held in the open position by means of a replaceable 165□F or 212□F U.L. listed fusible link. Stainless steel negator closure springs shall be supplied on horizontal-mount models, in order to insure proper blade closure. Model 119ALS dampers shall be supplied with U.L. listed duct sealant. Model 119BL dampers shall be supplied with a B-pan cover plate mechanically fastened to the frame. Model 119CL dampers shall be supplied with an 18 ga.

galvanized steel welded sleeve/housing, with minimum 22 ga. galvanized steel transition plates and duct collars.

D. Duct access shall be provided on the correct side for resetting the fire damper.

2.11 REGISTERS, GRILLES AND DIFFUSERS

A. The Contractor shall furnish and install grilles and diffusers at the location shown on the plans using the types and sizes specified. Grilles and diffusers shall be factory finished enamel. Supply grilles shall include foamed plastic gaskets where applicable and the contractor shall furnish any supplementary flanges, collars or mounting devices necessary to attach his work to the construction of the building.

B. A manufacturer is used as a standard for selection and basis for type and quality, however, equivalent units by others listed will be accepted. Acceptable manufacturers are: Titus, Hart & Cooley/Tuttle & Bailey, Price, Krueger, Donco, Carnes, Reliable, Nailor, and Architectural Grille. Where not scheduled, units shall be sized, furnished and installed per manufacturer's recommendations, including proper throw for specific application.

2.12 DAMPERS AND SPLITTERS

A. All dampers or splitters required for this work shall be sufficiently stiffened to prevent noise or vibration and in no case shall be lighter than twenty (20) gauge galvanized iron and shall be fitted with accessibly located adjuster. Dampers and regulators shall be as manufactured by Ruskin, Honeywell, Penn/Johnson Controls, or approved equal. Control damper shall be opposed blade as made by Ruskin, Honeywell or Johnson Controls, of 16 gauge construction. Shutoff dampers shall be "Zero leakage type". Dampers for field constructed mixing boxes shall be parallel blade with blades oriented to promote mixing, equal to Ruskin CD50.

2.13 TURNING VANES

A. Turning vanes shall meet SMACNA HVAC Duct Construction Standards sufficiently stiffened to prevent vibration. Turning vanes shall be equal to Harper, double wall turning vanes, fabricated from the same material as the duct. Tab spacing shall be SMACNA standard. Rail systems with non-standard tab spacings shall not be accepted. All tabs shall be used, do not skip tabs. Mounting rails shall have friction insert tabs which align the vanes automatically. Vanes shall be subjected to tensile loading and be capable of supporting 250 lbs. when fastened per the manufacturer's instructions, equal to Ductmate PRO-Rail.

2.14 ACCESS

A. Provide hinged access panels in ducts and in walls or ceiling where concealed adjacent to all dampers, fire dampers, splitters and temperature control devices. Fasteners shall be Camlock type for ready access and tight locked shutoff. Units shall be UL approved or contractors shall furnish an affidavit for units through rated walls and ceilings. Location of access panels shall be coordinated with the other trades subject to the approval of the Owner or Architect/ Engineer.

2.15 VIBRATION, ISOLATORS AND FLEXIBLE CONNECTORS

A. Type 2 Hangers: Model SFH by Peabody Consolidated Kinetics, or equal by Korfund Vibration Mounting and Control, Inc., or Mason combination spring and fiberglass hangers, incorporating 2" thick neoprene jacketed pre-compressed molded fiberglass inserts in series with springs, all encased in welded steel brackets. The outside spring diameter shall be a minimum of 0.8 times the designed spring operating height, and shall have a minimum additional travel of 50% between the design height and solid height.

B. Ductwork Connections: All junctions between ductwork and air handling units or fans shall be made with flexible connections to eliminate vibration transmissions, "Thermafab" flexible connections by Duro-Dyne Corporation, Farmingdale, New York, or approved equal by Ductmate. Material shall be a high strength fiberglass fabric-coated on one side with an

inorganic elastomeric compound, nonporous, fireproof, with high tensile strength, low smoke emissions to withstand 500`F continuous duty. Allow 2" gap between ends being joined.

C. Vibration isolation equipment selection shall also comply with Table 42 of Chapter 43, ASHRAE Applications Volume, on Sound and Vibration Control.

D. Where air handling unit non-fan sections or ductwork plenums are set on concrete pads, isolate from the concrete using continuous 1/2 inch thick Korfund or equal composition rubber isolation pad. Fan sections must be installed with internal or external spring isolation.

E. See Part 3 for installation.

2.16 DUCT SLEEVES

A. Provide sleeves for all duct work passing through walls, floors, ceilings and partitions. Sleeves shall be 18 gauge galvanized sheet metal. Sleeves through other areas shall be 1/8" plate and angle iron. Sleeves through fire-rated partitions shall be filled with 3M Fire Barrier material as specified in Section 22 01 00.

2.17 OTHER MATERIALS

A. All other materials not specifically described or listed but required for a complete and proper installation of the work of this section, shall be as selected by the Contractor, subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that the work of this section may be installed in accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect/Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

C. Field Measurement:

1. Measurements of actual field conditions must be made by contractor to verify equipment and ductwork installation requirements.

3.02 INSTALLATION OF EQUIPMENT

A. General:

1. Install all equipment where indicated on the approved shop drawings.
2. Avoid interference with structure and the work of other trades; do not cut into load carrying members without the specific approval of the Architect/Engineer.

B. Inspection:

1. Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

3.03 INSTALLATION OF DUCTS

A. Fabrication of Rectangular Ducts:

1. Fabricate and install all ducts in strict accordance with the approved shop drawings and the referenced standards.

2. On sheet metal ducts, cross-break or roll form all flat surfaces to prevent vibration.

B. Duct Layout:

1. All duct sizes shown on the drawings are net dimensions inside the insulation; wherever obstructions require a change in duct size, maintain equivalent areas.

2. On rectangular duct, make all duct elbows right angle type with elbow turns or turning blades, or make elbows with a radius of 1-1/2 times the duct width.

3. Fabricate transitions using a 30` angle (max.) when reducing a dimension and 45` angle (max.) when increasing a dimension.

4. One (1") inch diameter test openings shall be furnished in ductwork where required for proper adjustment of all supply and exhaust systems. Provide suitable pressure-tight coverings for openings when not in use.

C. Round and Oval Duct Installation: Install all round and oval duct in accordance with manufacturer's recommendations, meeting at least the requirements of McGill Airflow and SMACNA.

1. Transverse joints and longitudinal seams shall be sealed with a duct sealant meet UL 723.

2. Duct Hangers shall meet SMACNA requirements and MAF requirements as minimum manufacturer's recommendations.

3. Where particulate accumulation is possible or anticipated hangers shall be adjusted accordingly.

4. Proper installation of ductwork is solely the responsibility of the contractor as is proper application of sealant, connections of branch fittings, taps for diffusers, protection of materials, recoating damaged PVC coated underground duct, and related activities necessary for a clean, neat, functional job.

D. Round and Oval Duct Performance:

1. Ductwork:

a. Duct shall be constructed and installed to maintain minimum friction loss throughout with the fewest possible joints, couplings kept tight to the duct wall surface, and projections into the ducts minimized.

b. Friction loss of single and double wall duct shall meet minimum requirements of SMACNA and MAF Duct System Design Reference Manual.

c. Ducts shall be subject to inspection and testing. Duct failing to meet performance requirements shall be replaced.

d. Testing shall be witnessed by an agent of the engineer and/or inspecting authority.

2. Fittings:

a. Fittings in a critical path or design leg shall be selected or constructed solely based on performance unless spatial restraints are present, with the lowest loss coefficient obtainable for the required fitting type.

b. If the location of the critical path is not specified, all fittings throughout the system shall have the lowest loss coefficient obtainable.

c. If the critical path is identified, care must be applied in meeting the aggregate pressure loss available without affecting acoustical performance of the system.

d. Only fittings with verifiable loss coefficients and performance data from laboratory testing are acceptable.

e. Performance of fittings shall meet minimum requirements of SMACNA and MAF Duct System Design Reference Manual.

f. Fittings are subject to same inspection and testing criteria as ductwork.

3. System performance has typically been optimized using a computer duct design program such as UNI-DUCT or approved equal. Any subsequent alterations to the design must be accompanied by a computer analysis of calculations showing that the proposed alterations will still provide the original design volume without increasing the system total pressure.

a. Any unavoidable field changes to the original design must be reported to the project engineer and recorded on the as-built drawings by the contractor.

b. Ductwork layout drawings shall be provided to coodinate with other utilities and structural members

E. Flexible Duct: Install flexible duct in accordance with manufacturer's recommendations. Maximum length of flex duct upstream of supply diffusers or return grilles shall be three(3) feet. Where 90° bends occur, hard ductwork shall be utilized instead of the flex duct.

F. Dampers and Splitters:

1. The Contractor shall strategically locate dampers, splitters, or volume controllers to accurately regulate the flow of air.

2. Install opposed blade balancing dampers where shown on the plans and in the fresh air intake and return air ducts at each unit, unless already furnished with the equipment. Dampers shall be constructed of not less than twenty (20) gauge galvanized steel, blades shall not be over twelve inches (12") wide or forty-eight (48") inches long. Damper blades shall be close fitting with blade shaft riding on Oilite or nylon bearings all mounted in heavy gauge channel iron. Use standard mixing boxes where shown.

3. Furnish and install volume regulators and dampers at all branch take-offs to diffusers and supply registers.

4. Contractor shall mark volume regulators and dampers with orange marking tape prior to insulation of ductwork. Marking tape will allow for location of devices by the T.A.B. Contractor and the Owner in the future.

5. After dampers have been finally adjusted, the open and closed position of each damper shall be marked on the duct adjacent to the damper quadrant. Also, Contractor shall scribe end of damper shaft parallel to open direction of damper to denote damper orientation.

G. Openings: The Contractor shall advise all parties concerned as to the proper size and shape of all necessary openings for ductwork, grilles, exhaust fans, gravity relief vents, and other system components, and shall direct said contractor in their proper placement. All voids around conduit, ductwork, tubing, and other items penetrating walls and floors of smoke barriers and rated walls shall be filled with Dow Corning Firestop Sealant or approved equal.

H. Ductwork Support: Hang and support ductwork as defined by SMACNA, Section IV, 1995 Manual, Second Edition, or as defined within. Hanger spacing shall not exceed 8 feet. Contractor must verify adequacy of supporting structures. In all cases, ductwork shall be securely and permanently installed in a rigid manner.

1. Horizontal, rectangular duct above 60" - use angle iron on each side and one across top and bottom of duct, welded or bolted together and spaced on 10 foot centers.

2. Horizontal, round duct above 36" dia. - use 1" x 16 gauge continuous U-shaped strap passing under duct and anchored to support in two places.

3. Vertical ducts shall be supported at each floor with angles. 12" x 12" or equivalent ducts shall have supports riveted to duct. Larger ducts shall be flanged and supports bolted to flange.

4. Where it is not convenient to support ductwork at the desired location, additional structure shall be provided by this contractor to meet the span and load requirements.

I. Duct Sealing:

1. Seal all VAV supply ducts upstream of VAV boxes and coil modules with Hardcast, or equal by Ductmate. Sealants shall comply with NFPA 90A with maximum flame spread of 25 and smoke development of 50.

   a. For indoor/outdoor duct sealing use Water Based VERSA-GRIP 181. Follow manufacturer recommended curing requirements.

   b. Use Hardcast 1092 FR for duct flange sealing.

   c. For sealing exterior ductwork, use RTA-50/DT Tape.

   d. For any other sealing requirements, follow recommendations of Hardcast at 800-285-7430.

2. Sealing shall meet SMACNA Class A on VAV supply duct up to VAV boxes and coil modules, and meet Class C elsewhere.

3. After curing, sealer shall be resistant to ultraviolet light and shall seal our water, air, and moisture. Sealer shall be UL listed for the specific application and conform to ASTM E 84.

4. **NOTE: All intake plenums and intake ductwork shall be sealed watertight from the intake louvers up to the air handling units such that any accumulation of rain or snow is contained and drained into the duct drains without damaging spaces below.**

J. Ductwork Leakage Criteria:

1. All transverse joints and longitudinal seams shall conform to SMACNA's Class A sealing requirements as defined on sections 1.6a and 1.7 of 1995 SMACNA Manual, Second Edition with Addendum 1, November, 1997.

2. Variable Air Volume Systems/Supply Ductwork allowable leakage from the Fan to VAV boxes or coil modules shall be one percent (1%) of design CFM and from the VAV boxes or coil modules to supply diffusers shall be two percent (2%) of design CFM.

K. Access Doors

1. Furnish and install sheet metal doors in ducts where shown on the drawings and at each other point where access to concealed equipment or control devices must be made through the ductwork.

2. Make all such doors air-tight with neoprene stripping and provide latch on each door openable from inside and outside the duct. No access door shall be smaller than duct width x 12" up to 12" duct. Duct 12" will have access door 12" x 24" and increase with duct width to 24" x 24". Access doors shall be hinged one side, open inside and outside, swing to seal tight from or by air pressure and meet necessary fire ratings as applicable.

3. Ductmate Sandwich Type Access Doors may also be used meeting either above minimum size requirements or of adequate size to allow easy access to equipment which must be maintained.

4. Also see specifications for access panels in Section 2.

5. Install access doors adjacent to duct silencers to allow access for inspection or cleaning.

L. Duct Cleaning:

1. Ducts shall be cleaned following the guidelines of the National Air Duct Cleaners Association standard NADCA 01, 1992, and in accordance with NADCA General Specifications for the Cleaning of Commercial Heating, Ventilating, and Air Conditioning Systems.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The owner shall be notified of any work being done prior to that work and the contractors shall accommodate the time with the owners representatives if they would like to be present.

B. The Testing, Adjusting and Balancing (TAB) shall include all work specified within this section including coordination with Mechanical and Controls Contractors.

C. Furnish all required personnel and equipment and perform all tests required to secure approval of the installation from all agencies having jurisdiction.

D. Balancing:

1. The contractor shall balance and adjust air moving equipment, air distribution, exhaust systems and hydronic systems. All instruments used by the contractor shall be accurately calibrated and maintained in good working order. Balance and adjust the air system in accordance with the recommendations contained in "Standards for Field Measurements and Instrumentation, Total System Balance" of the Associated Air Balancing Council or the NEEB Manuals.
2. Upon completion of the system balancing, the contractor shall submit to the Architect/Engineer five (5) typewritten air balance reports with all pertinent data, including actual operating conditions report. Utilize standard NEEB or AABC forms or equal forms.

1.02 DRAWINGS AND SPECIFICATIONS

A. All portions of the project specifications are a part of these specifications as stated above. It shall be the balancing contractor's responsibility to properly coordinate the requirements of these provisions with the Mechanical Contractor.

1.03 GENERAL

A. The Mechanical Contractor shall select and employ an impartial, independent balancing agency will provide testing and balancing services for the heating, ventilating, and air conditioning (HVAC) systems of this project. These services shall be paid for by the Mechanical Contractor. Final approval of the balancing contractor shall be by the Engineer.

B. The schedule for testing and balancing the HVAC systems shall be established by the Mechanical Contractor in coordination with the balancing agency (on a critical path network). It is the balancing agency's responsibility to initiate this continuing coordination to determine his schedule for final testing and balancing services and the periodic inspections required during construction.

C. The balancing contractor will have a contractual relationship with the Mechanical Contractor but will be responsible to the Engineer for the satisfactory execution of testing and balancing the HVAC systems. The Mechanical Contractor shall have allowed sufficient funds in his project cost estimate for the testing and balancing phases.

1.04 QUALIFICATIONS OF THE BALANCING AGENCY

A. The balancing agency should be a member of the Associated Air Balance Council (AABC) or NEBB.

B. The balancing agency shall submit records of experience in the field of air and hydronic system balancing or any other data as requested by the Engineer. The supervisory personnel for the firm shall have at least five (5) years' experience, and all the employees used in this project shall be qualified technicians in this specific field.

C. The balancing agency shall furnish all necessary calibrated instrumentation to adequately perform the specified services. An inventory of all instruments and devices in possession of the balancing agency may be required by the Engineer to determine the balancing agency's performance capability.

1.05 STANDARDS

A. The balancing agency shall perform the services specified herein in accordance with the Associated Air Balance Council's or NEBB's standards and procedures including revisions, to the date of the contract.

B. All terms in this specification shall have their meaning defined as stated in the Standards.

C. If these specifications set forth more stringent requirements than the AABC or NEBB Standards and procedures, these specifications shall prevail.

1.06 DOCUMENTS

A. The Mechanical Contractor will provide the balancing agency one copy of the following documents:

1. Project drawings and specifications.
2. Approved construction revisions pertaining to the HVAC systems.
3. Approved submittal data on HVAC equipment and systems to be installed by the mechanical subcontractor.
4. Approved HVAC shop drawings.
5. Approved HVAC wiring diagrams, control diagrams, and equipment brochures, as appropriate.

1.07 COORDINATION

A. It will be necessary for the balancing agency to perform his services in close coordination with the Mechanical Contractor.

B. The plans and specifications have indicated meters, valves, dampers, and other devices for the purpose of adjusting the system to obtain optimum operating conditions. It will be the responsibility of the Mechanical Contractor to install these devices in a manner that will leave them accessible and readily adjustable. The balancing agency shall provide guidance if there is a questionable arrangement of a control or balancing device.

C. The General Contractor, Mechanical Contractor, Controls Systems Contractor, and the suppliers of the HVAC equipment shall all cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

1.08 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR

A. The Mechanical Contractor shall complete the installation and start all HVAC systems to ensure they are working properly, and shall perform all other items as described hereinafter to assist the balancing agency in performing the testing and balancing of the HVAC systems.

B. Air Distribution systems:

1. Verify installation for conformity to design.
2. Terminate all supply-, return- and exhaust ducts, and pressure test them for leakage, as required by specification.
3. Ensure that all volume-, splitter-, extractor-, and fire dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside-, return-, relief-, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
4. Verify that all supply-, return-, exhaust-, and transfer grilles; registers; diffusers; and high-pressure terminal units are installed and operations.

5. Ensure that air-handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air.
6. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
7. Make any necessary changes to the sheaves, belts, and dampers, as required by the balancing agency, at no additional cost.
8. Install clean filters.

C. Water Circulating Systems:
1. Verify installation for conformity to design.
2. Check all pumps to verify pump alignment and rotation.
3. Ensure that systems are clean, with the proper strainer screens installed for normal operation.
4. Check all pump motors for current and voltage, to ensure that motors do not exceed nameplate rating.
5. Provide overload protection of proper size and rating.
6. Ensure that all water circulating systems shall be full and free of air; that expansion tanks are set for proper water level; and that all air vents were installed at high points of systems and are operating.
7. Check and set operating temperatures of heat exchangers to design requirements.

1.09 RESPONSIBILITIES OF THE CONTROLS SYSTEMS CONTRACTOR

A. The Controls Systems Contractor shall complete the installation of the temperature control system, and operate and test all control systems to ensure they are functioning properly as designed. The temperature control contractor shall assist the balancing agency in testing and balancing the HVAC systems, as described hereinafter.
1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
4. The Controls Contractor shall allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

1.10 NOTIFICATION FOR TESTING AND BALANCING WORK TO BEGIN

A. The Mechanical Contractor shall notify the balancing agency in writing when all heating, ventilating, and air conditioning systems are complete and ready for testing and balancing. The mechanical contractor shall attest that he has completed all items as described in these specifications.

B. If, upon commencing the work, the balancing contractor finds that the systems are not ready, or if a dispute occurs as to the readiness of the systems, the balancing agency shall request an inspection to be made by the Engineer. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for

testing and balancing. Should the inspection reveal the notification to have been premature, all costs for the inspection and work previously accomplished by the balancing agency shall be paid for by the general contractor. Furthermore, such items that are not ready for testing and balancing shall be completed and placed in operational readiness before testing and balancing services shall again be requested.

1.11 QUANTITIES

A. In all cases where a device, operation, procedure, tool, equipment, or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices, as are required to complete the testing and balancing specified herein.

1.12 STORAGE

A. In coordination with the general agency, the balancing contractor shall arrange for an area of ample size and convenient location for storage of tools, equipment, and other items as required.

1.13 PRO-RATE EXPENSE

A. The balancing contractor shall not be responsible in whole or in part for any pro-rate expense for utilities, or expense of any nature relating to the rest of the building or other contractor's work.

PART 2 - BALANCING SPECIFICATIONS AND RESPONSIBILITIES OF THE BALANCING AGENCY

2.01 SCOPE

A. In accordance with Project Drawings and Specifications and as specified herein, the balancing agency shall provide all supervision, personnel, instruments, calibration equipment, and all other materials and services necessary to perform all testing and balancing of the heating, ventilating, and air conditioning systems. All test data including all pertinent calculations shall be reported on appropriate forms.

2.02 GENERAL

A. The testing and balancing of the heating, ventilating, and air conditioning systems shall be performed by an independent balancing agency approved by the Engineer. The balancing agency shall have a minimum of five (5) years specialized experience in air- and hydronic system balancing, and possess calibrated instruments, qualified test-and-balance engineers, and skilled technicians to perform all required tests.

B. The tests shall demonstrate the specified capacities and operation of all equipment and materials comprising the systems. The balancing agency shall then make available to the Owner's representative such instruments and technicians as are required for spot checks of the system.

C. The balancing agency shall not instruct or direct the mechanical contractor in any of the work. Any proposed changes or revision in the work shall be submitted to the Engineer in writing. The Engineer shall then process the proposal as appropriate.

2.03 AIR SYSTEM PROCEDURES

A. The balancing agency shall perform the following testing and balancing functions in accordance with the Associated Air Balance Council National Standards or NEBB Standards:

1. Fan Speeds: test and adjust fan RPM to achieve design CFM requirements.
2. Current and Voltage: measure and record motor current and voltage.
3. Pitot-tube Traverse: perform a Pitot-tube traverse of main supply and return ducts to obtain total CFM. If a Pitot-tube traverse is not practical, the summation of the outlets

or inlets may be used. An explanation why a traverse was not made must appear on the appropriate data sheet.

4. Outside Air: test and adjust system minimum outside air by Pitot-tube traverse. If a Pitot-tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperatures. Make allowances for heat or compression and motor heat where applicable.
5. Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan and pressure drop across components including coils, filters, mixing boxes and silencers.
6. Air Temperature: Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
7. Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
8. Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
9. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
10. Tolerances: Test and balance each diffuser, grille, and register to within 10% of design requirements.
11. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
12. Description: record the size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
13. Terminal Boxes: Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements. All associated temperature controls shall be checked for proper operation and calibration. If the terminal boxes have separate settings for heating and cooling CFM, the CFM quantities for each shall be recorded on air outlet data sheets. All diffusers connected to the terminal box shall be read out in the heating and cooling modes and their readings recorded on air outlet data sheets.
14. Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.
15. Prove tightness of duct construction by operating air handling equipment and physically verifying absence of air leakage, both audibly and manually.

2.04 HOT WATER PROCEDURES

A. The various water circulating systems shall be filled, purged of air, and put into operation before hydronic balancing.

B. The flow of water through the two new VAV coils shall be adjusted by manipulating balancing valves until the rated pressure drop through the coil or metering device is obtained.

C. The balancing agency shall perform the following testing and balancing functions in accordance with the AABC National or NEBB Standards:

1. Water Treatment: Examine the water in the system and determine if the water has been treated and cleaned. If it has not, request the mechanical contractor to clean and treat the water.
2. Strainers: Request that the mechanical contractor clean all strainers.
3. Air Vents: Check all air vents at the high points of the water system and determine if they are installed and operating.
4. Valves: Set all balancing valves and automatic temperature control bypass valves to the full-open position for balancing. Three-way valves: the rated pressure drop shall

first be adjusted with the three-way valve set so that all water flows through the coil. The bypass balancing valve shall then be adjusted on each coil until equal pressure drop between supply and return connections is obtained, with the three-way valve set to bypass the coil.

5. Tolerances: Proceed to balance all hot-water coils within 10% of design requirements.
6. Marking: Mark all settings and record all data after completing the flow readings and coil adjustments.

2.05 SPECIAL SYSTEMS PROCEDURES

A. As required, special systems procedures must be specified separately.

2.06 VERIFICATION OF TEMPERATURE CONTROL

A. The balancing agency shall be assisted by the temperature control contractor in verifying the operation and calibration of all temperature control systems. The following tests shall be conducted.

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Calibrate the room thermostats after installation and before thermostat control verification tests are performed. The balancing contractor shall prove the accuracy of the final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

2.07 TEST-AND-BALANCE REPORT

A. The test-and-balance report shall be complete with logs, data, and records as required herein. All logs, data, and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the balancing agency's certified test-and-balance engineer.

B. Five (5) copies of the test-and-balance report are required and shall be submitted to the Engineer.

C. The report shall contain the following general data in a format selected by the balancing contractor.

1. Project number
2. Contract number
3. Project title
4. Project location
5. Project Architect
6. Project Mechanical Engineer
7. Test & balance agency
8. Test & balance engineer
9. General contractor
10. Mechanical subcontractor
11. Dates tests were performed
12. Certification

D. The test-and-balance report shall be recorded on report forms conforming to the recommended forms in the AABC National Standards or NEBB Standards. At a minimum, the report shall include:

1. Preface: A general discussion of the system, any abnormalities and problems encountered.
2. Instrumentation list: The list of instruments including type, model, manufacturer, serial number, and calibration dates.
3. System Identification: In each report, the VAV boxes, zones, supply, return, and exhaust openings, and traverse points shall be numbered and/or lettered to correspond to the numbers and letters used on the report data sheets.
4. Air handling equipment test-report forms: Record the following on each air-handling equipment test form:
    a. Manufacturer, model number, and serial number.
    b. All design and manufacturer-rated data.
    c. Total actual CFM by traverse if practical; if not practical, the sum of the outlets may be used, or a combination of each of these procedures. For specific systems, such as ones with diversity, see the AABC National Standards.
    d. Suction and discharge static pressure of each fan, as applicable.
    e. Outside-air and return-air total CFM.
    f. Actual operating current, voltage, and brake horsepower of each fan motor.
    g. Final RPM of each fan.
    h. Fan and motor sheave manufacturer, model, size, number of grooves, and center distance.
    i. Belt size and quantity.
    j. Static-pressure controls' final operating set points.
5. Pump equipment test-report form including:
    a. Manufacturer, model number, and serial number.
    b. All design and manufacturer-rated data.
    c. Total actual measured flowrate in gpm.
    d. Differential pressure across pump and total system pressure drop in ft of head or psi.
6. Heating/Cooling coil test-report form including:
    a. Manufacturer, model number, and serial number.
    b. All design and manufacturer-rated data.
    c. Total actual measured flowrate in gpm.
    d. Equipment measured pressure drop in ft of head or psi.

2.08 FINAL ACCEPTANCE

A. At the time of final inspection, the balancing agency shall recheck, in the presence of the Owner's representative, specific and random selections of data recorded in the certified test-and-balance report.

B. Points and areas for recheck shall be selected by the Owner's representative.

C. Measurements and test procedures shall be same as the original test and balance.

D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.

E. If random tests demonstrate a measured flow deviation of 10% or more from that recorded in the certified test-and-balance report, the report shall automatically be rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, a new certified test-and-balance report submitted, and a new inspection test made, all at no additional cost.

2.09 OPPOSITE SEASON TEST

A. The balancing agency shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The balancing agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

END OF SECTION

SECTION 23 09 00
CONTROLS & INSTRUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Base Bid is to include a direct digital control system for both the air handling equipment and the hot water and chilled water distribution systems. The system shall be constructed and operated per this specification.

B. Work includes furnishing and installation of complete and operable Building Management System/Automatic Temperature Control (BMS/ATC) system, including, but is not necessarily limited to, the following:

1. General ATC System configuration is intended to be a local master panel and graphical user interface accessible through a Web Browser.
2. All controls shall be electronic unless otherwise specified.
3. Control systems for new hot water boilers, hot water heating system, air handling units and reheat systems.
4. Miscellaneous controls for dampers, including installation and interlock of smoke detectors for air handling systems (control interlock only, Electrical Contractor shall provide smoke detectors).
5. Provide all power-operated dampers for all controlled systems, where the motor operator is not specifically called for, e.g. a motor operated damper under a throttled centrifugal roof exhauster would be by the control contractor, where a two-position motor operated damper specified with a combustion air louver or with an exhaust fan would be by the louver or fan manufacturer. See Schedule.
6. All necessary interfaces with factory and contractor furnished equipment and interfaces with packaged control systems.
7. Coordination of thermostat locations with all interferences. Review interior elevation drawings before roughing in thermostats. In case of question, review with the Construction Manager or Architect/Engineer. Mount all thermostats with the top of the thermostat at 48" height. This will require that the rough-in 2 x 4 box be mounted correctly relative to the type of thermostat used. Coordinate height with light switches.
8. Control panel cabinets for temperature control systems.
9. All required wiring including all 120v wiring not shown on Electrical plans, and interposing relays for energizing motors in starters from the BMS/ATC.
10. Verify heating and cooling system piping has been flushed by mechanical contractor prior to installation of control valves.
11. The systems shall be complete in all respects, tested and ready for operation.
12. Provide labor for coordination with test and balancing work.
13. All materials, equipment and apparatus shall be new and of first-class quality.
14. The ATC systems shall be supplied and installed completely under the ATC Contract. Components shall be mounted and wired by the ATC Contractor.
15. The engineering, installation, calibration, software programming and checkout necessary for complete and fully operational ATC systems, as specified hereafter, shall be provided by the ATC Contractor.
16. Comply with UL, NEC and state and local codes.
17. Provide hands-on training to the Owner adequate to allow proper day-to-day operation of the system.

C. Related Work Described Elsewhere:

1. Section 28 31 00: Fire Alarm System.

2. Section 22 01 00: Mechanical and Plumbing General Provisions
3. Section 23 00 00: Heating, Ventilating & Air Conditioning
4. Section 23 05 93: Testing, Adjusting & Balancing
5. Section 23 52 00: Hot Water Heating Systems
6. The Controls subcontractor shall be bound by the same Specification that all mechanical and electrical trades must follow.

1.02 MATERIAL FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Control Dampers

B. Control Valves

C. Sensor wells and taps.

D. VAV box power supply transformers.

1.03 INSTALLATION OF MATERIAL PROVIDED BY OTHERS

A. Provide connection from water flow switch and low water cutout (provided with boiler) to boiler control panel.

B. Provide connection from condensing unit discharge air temperature sensor and condensing unit control panel and connection from condensing unit control panel and refrigerant solenoid valves, and suction line t-stat.

1.04 RELATED WORK PROVIDED BY OTHERS

A. Electrical power connection to control cabinet in Mechanical Room.

B. Fire Alarm relay interface for air handling unit located within five feet of temperature controls cabinet.

C. Electrical contractor will make 120V connections for VAV box power supply transformers. The Temperature Controls Contractor will provide the transformers to the Electrical Contractor for connection. Low voltage connection to VAV box controls will be by the control contractor.

1.05 QUALIFICATIONS

A. The Controls subcontractor shall be a qualified and experienced contractor with at least five years experience in the installation of such systems and shall maintain a fully staffed service and parts office within 100 miles of the job site. Contractors may be asked to provide qualifying documents to the Engineer if requested.

1.06 SUBMITTALS

A. Shop Drawings:
   1. Provide submittals in accordance with Section 01 33 00.
   2. Within 20 days after award of contract, and before any of the materials of this section are delivered to the job site, submit complete shop drawings to the Architect/Engineer in accordance with the provisions of these specifications.
   3. Each set shall include diagrammatic layout, wiring diagrams, reset schedules, sequence of operation, equipment schedule, valve schedule with sizing data, damper schedule with motor sizing data, and catalog sheets for each device to be used. Include list of both new and existing materials as applicable.

B. Record Drawings:
   1. Upon completion of the job, this Contractor must furnish record drawings in accordance with Division 1.

1.07 WARRANTY

A. All devices and installation shall be warranted to be free from defects in workmanship and material for a period of one year from the date of job acceptance by the owner. Any equipment, software, or labor found to be defective during this period shall be repaired or replaced without expense to the owner. Factory authorized warranty service shall be available within 100 miles of jobsite.

1.08 CODES AND STANDARDS

A. All electrical work required in this section shall comply with all requirements of pertinent electrical codes, local authorities, and Section 26.

1.09 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacements:

1. In the event of damage caused by this contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL DDC REQUIREMENTS

A. The Automatic Temperature Control System shall provide the necessary Hardware, Software, and Network Communication abilities to provide trending and alarm functions for the HVAC equipment and systems as described in this specification. Current control capabilities shall include: Time of Day scheduling, Direct Digital Control, Custom Control, Boolean Logic, Optimum Start/Stop, Temperature Control, Remote Communications, Trend Logs, Alarm Logging, Expanded Informational Messages, and After Hours Override.

B. The new devices shall interface with the existing DDC system and components.

C. The ATC System shall allow full user operation with a minimum of training. It shall have an Graphical and English language display, with both user prompts and a "help" user tutorial. The graphical interface will include graphical depictions of the equipment and points controlled and monitored by the ATC system.

D. All applications programs shall be pre-engineered and pre-tested.

E. All required wiring for the temperature regulation systems shall be provided by the Contractor, including all wiring (including 120v and 24v), conduit, labor, etc., for all electric room thermostats, snap-on thermostats, freeze thermostats, and related devices completely in accordance with the applicable electrical specifications, unless otherwise specified or shown on the plans.

F. When possible, run all control wire concealed. If it must be run exposed, enclose in conduit (use steel wire-mold in occupied areas), neatly installed, parallel to building lines. Where ceilings are used as a return plenum, control wire shall either be run in conduit or using wire rated for NFPA and Fire Marshal requirements. Wire shall be attached to building structure, not laying on top of ceiling tiles.

G. Since some indicated set-points, ranges and other variables are approximate and/or nominal, applicable control components must be capable of field and/or computer adjustment to actual setpoint, ranges, or other settings which will provide proper operation of the entire control system and attainment of required capacities. Control components shall be of proper sensitivities to preclude objectionable cycling and yet maintain control points adequately close to set-points so that offset is not objectionable.

H. Should a point become invalid, the ATC System shall allow the operator to manually override the point.

2.02 OPERATOR INTERFACE

A. Color Graphics - Color graphics shall include at a minimum the following "system schematic" graphics with dynamic information updating:

B. VAV boxes and reheat coils (all sensed and/or control points).

C. Exhaust fans and exhaust/relief fans (all sensed and/or control points)

D. Floor plans showing zone temperatures and/or temperature alarms.

E. Operator shall be able to view and change set-points on all equipment and be able to control and monitor actual status of all equipment from the graphic display. Operator shall be able to rapidly and easily move from one graphic screen to the next. If is acceptable to combine some of the above graphic screens if feasible.

2.03 NETWORK CONTROLLERS

A. General: Provide an adequate number of Building Management Panels to provide the performance specified above. Each of these panels shall meet the following requirements.

B. The Building Automation System shall be composed of one or more independent, stand-along, microprocessor based Network Controllers to manage the global strategies described in Application software section.

C. The Network Controller shall have ample memory to support its operating system, database, and programming requirements.

D. The multi-tasking operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

E. Data shall automatically be shared between Network Controllers when they are networked together.

F. The database and custom programming routines of remote Network Controllers shall be editable from a single operator station.

G. The Network Controller shall continually check the status of all processor and memory circuits. If a failure is detected, the controller shall:

H. Assume a predetermined failure mode.

I. Emit an alarm.

J. Display card failure identification.

K. Communications: Each Network Controller and Operator Workstation shall reside on the peer to peer LAN. This LAN shall be self configuring and shall automatically re-configure as nodes are added or removed. LAN communications shall conform to the standards of IEEE 802.3, 802.4, 802.5 or ANSI 878.1 and follow the OSI model. LAN communications shall be at a minimum of 2.5 MBPS.

1. Hard Wired Connections: Provide cable between all nodes on the system LAN. Provide all necessary Hubs, Repeaters and Bridges to complete the network. All system devices including Hubs, Repeaters and Bridges shall be monitored as part of the system and annunciated in the event of communications or power loss.
2. Protocol: Communications protocol on the network shall conform to the standards defined by the proposed ASHRAE/ANSI 135P (BACnet). At a minimum the system shall support Read/Write services of Analog and Binary objects.
3. Proprietary protocols may be used were approved by the Architect/Engineer.

L. Serviceability: The Network Controller should be designed in a modular fashion so that the enclosure may be roughed in prior to the installation of the electronics. Provide diagnostic

LEDs for power, communications, and alarms. The controller shall have provisions for expansion and future controller architectures. All wiring connections shall be made to field serviceable terminal strips or to a termination card connected by a ribbon cable.

M. Memory: The Network Controller shall maintain all BIOS and programming information in the event of a power loss for at least 7 days. If a battery backup is used, the batteries must be replaced at the end of the warranty period. The system BIOS shall be easily upgradeable from the PC workstation without the need for going out to the panel. System manufacturer shall provide current version software and firmware at the end of the warranty period.

2.04 APPLICATION SPECIFIC CONTROLLERS

A. Application Specific Controllers shall be stand-along, microprocessor based Direct Digital Controllers with sufficient memory to handle its operating system, database and programming requirements.

B. The Application Specific Controller shall be pre-programmed, tested, and factory mounted on the mechanical equipment to ensure reliability. Where factory mounting is not possible, the controllers shall be factory programmed and tested prior to shipment to the jobsite. The controllers shall be clearly labeled as to controller type, where it is to be installed, and software address (if applicable). The controller shall be fully tested upon the installation to ensure that it is properly matched to the equipment it is controlling.

C. The controller shall communicate with other devices on the communication network and be fully integrated with the other system components.

D. The hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient shall be mounted within waterproof enclosures, and shall be rated for operation at -40°F to 155°F.

E. Controller used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 35°F to 120°F.

2.05 CUSTOM APPLICATION CONTROLLERS

A. The Custom Application Controllers shall provide stand-alone control and require no additional system components for complete operation. It shall have sufficient memory to support its operating system, database, and programming requirements.

B. All programming required for operation shall be memory resident and shall be retained in permanent memory. Battery backup for a minimum of 72 hours is also permissible.

C. The Custom Application Controller shall be configured such that the Portable Operator Terminal can be plugged directly into it or within sight for programming, editing, and other operator functions.

D. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient shall be mounted within waterproof enclosures, and shall be rated for operation at -40°F to 155°F.
2. Controller used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 32°F to 120°F.

2.06 INPUT/OUTPUT INTERFACE

A. Hardwired inputs and outputs may tie into the system through System Application, custom Application, or Application Specific Controllers. Slave devices are also acceptable. Any critical points requiring immediate reaction shall be tied directly into the controller hosting the control software algorithm for the critical function.

B. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of 12MA at 12VDC to be compatible with commonly available control devices. All status points shown on the points list shall be positive proof differential pressure or current sensing binary switches.

C. Analog inputs shall allow the monitoring of low voltage, current, or resistance signals and shall have a minimum resolution of 0.1% of the sensing range. Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.

D. Binary outputs shall provide a continuous low voltage signal for on/off control of remote devices.

E. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 milliampere signal as required to provide proper control of the output device. Systems that utilize a pulse width modulating output (PWM) shall include a position feedback AI for each output.

2.07 MISCELLANEOUS

A. Duct mounted Control Dampers

1. All automatic control dampers shall be parallel or opposed blade type as required to match application. Note that dampers for field constructed mixing boxes shall be parallel blade with blades oriented to promote mixing.
2. The frame shall be 4" x 1" x 0.125" minimum of 6063T5 extruded aluminum hat channel with hat mounting flange on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity. Blades shall be airfoil type extruded aluminum (maximum 6" depth) with integral structural reinforcing tube running full length of blade.
3. Blade seals shall be extruded vinyl double edge design with inflatable pocket which enables air pressure from either direction to assisting blade to blade seal off. Blade seals shall be non-corrosive two-piece molded synthetic. Axles shall be square or hexagonal (round not acceptable) to provide positive locking connection to blades and linkage. Linkage to be concealed in frame. Damper shop drawings shall include performance data developed from testing in accordance with AMCA Standard 500 in AMCA approved laboratory showing pressure drop and leakage for all sizes of dampers required at all anticipated flow rates and pressure differentials. Dampers shall be rated to leak no less than 6 CFM/square foot at a 4" WG pressure differential.
4. Each damper section shall be rated for air flow velocities up to 6,000 FPM and static pressure at close off up to 6" WG.
5. In cases where multiple sections comprise the whole damper, balanced and symmetrical drive forces through jack-shafting shall be applied to each section and be attached to each end of representative blade in each section. In no case shall there be torque transmitted through the blade or end linkages from one section to another.
6. Dampers shall be equal to Ruskin CD 50.

B. Damper Operators

1. Electronic damper operators shall be positive positioning (power both directions) and in the case of power failure spring return to safe position.
2. Operators to be factory selected, mounted and tested for proper operation based on unit size, type and torque requirements to provide smooth positioning without fluttering.
3. Provide at least one damper motor per 48 inch x 48 inch square damper, unless more motors are otherwise indicated by the function requirements.

C. Control Valves

1. All valves shall be sized by the ATC Contractor and be adequate to meet the needs of the application. Sizing is subject to Engineer's approval. Valves shall be delivered to the HVAC Contractor for installation.
2. Valves for hot water and chilled water control shall be of the modulating electric type and fully-open pressure drops not exceeding 10 feet of water. Valves shall have a true linear flow characteristic in relation to valve opening. Valve body shall be cast iron or bronze. Seat and inner valve material shall be chrome nickel steel. Valve

sizes 2 inches and smaller shall be screwed and supplied with union fittings. Valve sizes 2.5 inches and larger shall be flanged. Valves shall be of the 3-way mixing or straight-through type as required by the sequence or shown on the drawings. Valve shall be equipped with a hand-wheel to allow manual positioning of valve in the absence of control power. Valves shall be of the spring-return type that will return to their normal position in the absence of control power.

3. Detachable actuator and valve body units for terminal reheat shall be of the modulating electric type. Valve body shall be brass. The inner valve and stem material shall be stainless steel. The valve shall be available in straight through, 3-way mixing with three connections and 3-way mixing four connections with an integral bypass. Valves shall be of the spring return type that will return to their normal position in absence of control power.
4. The 2.5" through 8" valves for primary hot water and chiller water applications shall be flanged. Valve body shall be cast iron with chrome nickel steel seat and alloy inner valve. Rangeability shall be at least 50 to 1. Detachable motorized valve actuator shall be of the 3-point floating type. Manual positioner shall be provided for hand operation of valve in the event of a power failure.
5. Valve Actuators: Valve actuators shall be electric.
6. Control valves and operators shall have minimum three year warranty.
7. Control valve and damper operators shall not produce audible noise to an occupant of the space, particularly where spring return is used. Operators producing objectionable noise shall be replaced with quiet equipment.

2.08 DIFFERENTIAL PRESSURE SWITCH

A. Air: ATC Contractor shall supply Dwyer, Inc. Series 1900, or approved equal, for air stream use with SPDT change-over contact. Switch shall be rated for the medium temperature being utilized.

B. Liquid: Current sensing relays shall be used in lieu of differential pressure switches for proof of pump flow. See below.

2.09 CURRENT SENSING RELAYS

A. Motor status indication, where shown on the points list or plans, shall be provided using current sensing relays. Relays shall be self-powered and shall have selectable AC ranges of 1-6 amps, 6-40 amps, and 4-200 amps. The switch output shall be rated for 30 VDC, 0.15 amps, with fully adjustable threshold setting, 0.25 seconds response time or less, able to accept #2 wire or smaller with 0.510 inch dia. window, and grade KJW-4051 housing material and UL listed flame retardant properties. Units shall be equal to Veris Hawkeye.

B. Where current sensing relays are applied on devices controlled by VFD's, provide devices capable of discerning between normal current reductions and those due to belt or coupling failure.

2.10 RELAYS

A. Pilot Relays: equal to Functional Devices RIB series, UL Listed, 10A contact rating, LED status indicator.

B. Relays for single phase fan/pump start/stop:

2.11 FLOW SWITCHES

A. Where motor status is shown to be indicated by flow switches, use paddle type with SPDT to establish proof of flow, using vapor-proof switch.

2.12 THERMOSTATS

A. Thermostats shall have SPDT contacts, switching at an adjustable setpoint with a range of

55 to 85°F. Shall have override buttons and controls to adjust setpoint at t-stat without any other equipment.

2.13 LABELS

A. Every control and device shall be labeled as to its function with either Lamicoid Labels that are screwed to panel and equipment or Laser-printed Mylar Labels that are adhered. Example: T-7, Chilled Water Supply Temp., etc. Label shall be keyed to symbol used in ATC System Control Prints.

2.14 CONTROL PANEL CABINETS

A. Furnish and install control cabinets of standard gauge steel or manufacturer's standard preformed fiberglass with hinged door. There shall be at least one (1) cabinet per mechanical room or control area in which control devices are mounted, unless otherwise indicated. Leave final as-built control print of related system and operating sequence in each panel.

2.15 TEMPERATURE SENSORS

A. Space Temperature Sensors:

1. Manufacturers: Building Automation products Inc. or Approved equal
2. Sensors shall be Thermistor type, with the following minimum performance:
   a. Dissipation Constant — 3mW/°C
   b. Stability Drift — Less than 0.02 °C/ year
   c. Accuracy: — ± 0.2°C between 0°C and 70°C
   d. Conformance: — DIN-IEC 751
   e. Operating Range: — 0°C to 70°C/0 to 99% RH
   f. Thermistors will be acceptable provided thermistor carries 10 year guarantee that device will maintain its accuracy within tolerance of ± 0.2°C between 0°C and 70°C.
   g. Space sensor covers shall be appropriate for the application, brushed aluminum, stainless steel, or manufacturer's standard plastic covers.
   h. Provide setpoint adjustment, space temperature indication, and occupied/unoccupied override button.
   i. Also ensure wall boxes are properly sealed to prevent migration of air between spaces or wall cavities.

B. Direct Insertion Temperature Sensors:

1. Sensor assembly shall be direct insertion, suitable for use with water systems, 150 pound class, minimum rating.
2. Sensor shall be platinum RTD type, minimum accuracy of ± 0.1% at 32°F.
3. Sheath diameter shall not exceed 5/16". Length shall be such that sheath, containing sensor, projects into center of air stream when installed. Material to be 304, 316 stainless steel and or machined brass. Process coupling to be 1/2" NPT.
4. Connection head to be NEMA 1, NEMA 4 or IP 66 rated enclosure type. Provide internal termination for RTD and wire connection. Conduit connection shall be 1/2" NPT.
5. Capillary Thermostats: Air handling unit controllers shall be provided with fully compensated remote capillaries with averaging bulb sensing elements.

2.16 SPACE HUMIDITY SENSORS/TRANSMITTERS:

A. Manufacturers: Building Automation Products Inc or Approved equal.

1. Space humidity sensors shall be wall mount type with brushed aluminum, brushed stainless steel 304 or 316 or standard manufacturer's plastic cover to match room

temperature sensors.

2. Sensing element shall be resistive bulk polymer impendence type. Sensor/transmitter shall have the following minimum performance.

3. Space humidity sensors shall be capable of withstanding wash down in the rooms. Materials of construction shall be 300 series stainless steel or other material to resist corrosive effects of sanitization where applicable.

Accuracy:	±3% RH at 25°C over 15-90% RH including hysteresis, linearity and repeatability.
Temperature Effect:	Less than 0.1% per °F at baseline of 68°F.
Sensitivity:	0.1% RH.
Repeatability:	0.5% RH.
Hysteresis:	Less than 1%.
Long Term Stability:	Less than 1% RH drift per year.
Operating Range:	0-99% RH, non-condensing, sensor.
	0-95%RH,non-condensing, electronics.
Output:	4-20 mA,0 to 5v,0 to 10v 0-100% linear, proportional
Power:	14-36 VDC.

B. Duct Mounted or Outside Humidity Sensors/Transmitters:

1. Manufacturers: Building Automation Products Inc or Approved Equal

2. Probe type, temperature compensated, and resistive bulk polymer impendence type. Sensor/transmitter shall have the following minimum performance.

Accuracy:	±3% RH at 25°C over 15-90% RH including hysteresis, linearity and repeatability.
Temperature Effect:	Less than 0.1% per °F at baseline of 68°F.
Sensitivity:	0.1% RH.
Repeatability:	0.5% RH.
Hysteresis:	Less than 1%.
Long Term Stability:	Less than 1% drift per year.
Operating Range:	0-99% RH, non-condensing, sensor. 15-90%RH, non-condensing, electronics.
Output:	4-20 mA, 0 to 5v, 0 to 10v 0-100% linear, proportional
Power:	14-36 VDC.

C. Duct Mounted or Outside Combination Temperature and Humidity Sensors:

1. Manufacturers: Building Automation Products Inc or Approved equal

2. Thermistor type, with the following minimum performance:

Dissipation Constant	3mW/ °C/
Stability Drift	Less than 0.02 °C/ year
Accuracy:	± 0.2°C between 0°C and 70°C
Conformance:	DIN-IEC 751
Operating Range:	0 to 70C
	0 to 99% RH

3. Thermistors will be acceptable provided thermistor carries 10 year guarantee that the device will maintain its accuracy within a tolerance of ± 0.2C between 0C and 70C.

4. Humidity probe type, temperature compensated, resistive bulk polymer impendence type. Sensor/transmitter shall have the following minimum performance.

Accuracy:	±3% RH at 25°C over 15-90% RH including hysteresis, linearity and repeatability.
Temperature Effect:	Less than 0.1% per °F at baseline of 68°F.

Sensitivity:	0.1% RH.
Repeatability:	0.5% RH.
Hysteresis:	Less than 1%.
Long Term Stability:	Less than 1% drift per year.
Operating Range:	0-99% RH, non-condensing, sensor. 0-95%RH, non-condensing, electronics.
Output:	4-20 mA, 0 to 5v, 0 to 10v 0-100% linear, proportional
Power:	14-36 VDC.

5. These combination temperature and humidity devices will be housed in the same enclosure a minimum enclosure rating of Nema 4 or IP 66. Outside air sensors shall be weatherproof of non-corrosive construction and UV protected.

D. Space Temperature and Humidity combination Sensors/Transmitters:

1. Manufacturers: Building Automation Products Inc or Approved equal.
2. Housing color shall be white.
3. Space humidity sensors shall be wall mount type with brushed aluminum, brushed stainless steel 304 or 316 or standard manufacturer's plastic cover to match room temperature sensors.
4. Sensing element shall be resistive bulk polymer impendence type. Sensor/transmitter shall have the following minimum performance.
5. Space humidity sensors materials of construction shall be 304 or 316 stainless steel or other material to resist corrosive effects of sanitization where applicable.
6. Humidity probe type, temperature compensated, and resistive bulk polymer impendence type. Sensor/transmitter shall have the following minimum performance.

Accuracy:	±3% RH at 25°C over 15-90% RH including hysteresis, linearity and repeatability.
Temperature Effect:	Less than 0.1% per °F at baseline of 68°F.
Sensitivity:	0.1% RH.
Repeatability:	0.5% RH.
Hysteresis:	Less than 1%.
Long Term Stability:	Less than 1% drift per year.
Operating Range:	0-99% RH, non-condensing, sensor. 0-95%RH, non-condensing, electronics.
Output:	4-20 mA, 0 to 5v, 0 to 10v 0-100% linear, proportional
Power:	14-36 VDC.

7. Sensors shall be Thermistor type, with the following minimum performance:

Stability Drift	Less than 0.02 °C/ year
Accuracy:	± 0.2°C between 0°C and 70°C
Conformance:	DIN-IEC 751
Operating Range:	40°F to 120°F 0 to 99% RH

8. Thermistors will be acceptable provided thermistor carries 10 year guarantee that device will maintain its accuracy within tolerance of ± 0.2C between 0C and 70C.
9. Space sensor covers shall be appropriate for the application, stainless steel, or manufacturer's standard plastic covers.
10. Provide visible setpoint, setpoint adjustment, space temperature indication and humidity indication, occupied/unoccupied override button and communications port where applicable.
11. Also ensure wall boxes are properly sealed to prevent migration of air between

spaces by using medical grade foam backing to completely insulate the space sensor.

2.17 OTHER MATERIALS

A. All other materials, not specifically described, but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and subject to approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:
   1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that all the work of this section may be installed in accordance with all pertinent codes and regulations, the original design, and the approved shop drawings.

B. Discrepancies:
   1. In the event of discrepancy, immediately notify the Architect/Engineer.
   2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

C. Work by others
   1. The HVAC Contractor shall:
      a. Furnish and install all necessary piping connections, taps and wells required for flow, pressure or temperature devices.
      b. Provide dampers, if so indicated, under Equipment Specifications.
      c. Install all automatic dampers furnished by the Controls Contractor. Dampers shall be set free of binding. Frames of dampers shall not be used to square duct work and shall be caulked for tight seal. Access doors or panels shall be furnished and installed by sheet metal workers to allow access to automatic control dampers.
      d. Assemble multiple section dampers with required interconnecting linkages, shafts and brackets and extend the required number of shafts through the ducts for externally-mounted damper motors. Jack shafts will be assembled with sealed roller or ball bearings of stainless steel construction.
   2. The Electrical Contractor shall install and connect all power wiring. Power wiring shall be defined as follows:
      a. Wiring of power feeds through all disconnect starters to electric motors.
      b. Power wiring to 120 Volt, single-phase motors shown on Electrical Plans.
      c. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by the Controls Contractor.
      d. Furnish and install disconnects where shown on the electrical drawings or where not included in the equipment list.
      e. Power connections to continuously operate exhaust fans.
      f. Final power connections to electric heating units and all 120V thermostats provided with these units.
      g. THE CONTROLS CONTRACTOR IS RESPONSIBLE FOR ALL POWER WIRING, INCLUDING 120V, NOT SHOWN ON THE ELECTRICAL PLANS.

D. All electrical work performed in the installation of the Controls system as described in this specification shall be per the National Electrical Code (NEC) and per applicable state and local codes. Where exposed, conduit shall be run parallel to building lines properly supported and sized at a maximum of 40% fill. In no cases shall field installed conduit

smaller than 1/2" trade size be allowed. Where conductors are concealed, cable rated for use in return air plenums shall be used.

3.02 INSTALLATION

A. General:

1. Install all control equipment required in this work in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer.
2. All installation work is to be scheduled and coordinated with other trades to expedite job progress. The installation will match erection of slabs and walls such that no cutting or patching will be required.
3. All capillary tubing mounted outside of ductwork shall be mounted on rigid surfaces to guard against breakage. Excess capillary shall be neatly coiled and secured to mounting surface with plastic bands and clamps.
4. Work by Others: All valves, Peet's plugs, thermometers and wells are to be installed by the piping contractor. All automatic control dampers shall be installed by skilled sheet metal workers. Dampers shall be set free of binding. Frames of dampers shall not be used to square duct work and shall be caulked for tight seal. Access doors or panels shall be furnished and installed by sheet metal workers to allow access to automatic control dampers.

PART 4 - SEQUENCE OF OPERATIONS

4.01 VAV BOXES

A. VAV boxes will operate in the occupied mode based on time schedule all boxes shall have local override for both occupied mode and temperature with occupied mode.

B. Occupied Mode:

1. The air valve shall modulate between the minimum setpoint indicated in the equipment schedule and 100% of design airflow based on space temperature setpoint.
2. The heating coil valve shall modulate to maintain the space setpoint temperature. In the classrooms where wall radiators are present the VAV box shall first activate the wall radiator control valve to satisfy the space setpoint temperature prior to modulating the VAV heating coil control valve.

C. Unoccupied Mode: VAV box air damper and hot water valve shall close (a minimum number of air dampers shall remain at minimum position when the air handling unit is operation to prevent fan surge). The VAV box will operate (and air handling unit will cycle on as necessary) to maintain unoccupied space temperature setpoint.

D. VAV box controls will monitor VAV box discharge air temperature.

END OF SECTION

SECTION 26 00 00
ELECTRICAL SCOPE OF WORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

Contractor shall provide all labor, materials, equipment, permits, supervision and other items noted in contract General Conditions, necessary to yield completely operable and tested systems as shown on the plans and specified herein. The work includes, but is not limited to, the following areas:

A. Electrical Demolition
   1. Remove light fixtures, wiring devices, communication devices, equipment connections, raceway etc. as required where walls, ceilings and floors are removed or to facilitate construction of new walls.

B. Electrical Work
   1. Lighting Systems
      a. Interior lighting system including fixtures and components for their complete installation.
      b. Individual lighting control devices.
   2. Temporary Power and Lighting
      a. Temporary lighting system for construction.
      b. Electrical equipment included panelboards, circuit breakers, receptacles, etc.
      c. Existing electrical service may be used to provide power for construction.
   3. Electric Power System
      a. Electrical power distribution equipment including circuit breakers, disconnect switches, and feeders.
      b. Electrical outlets and receptacles.
      c. Motor starters, disconnects and control devices.
      d. Electrical connection and/or installation of equipment provided by others including:
         i. HVAC and plumbing equipment and associated control panels, motor starters, disconnect switches, control devices, etc.
         ii. Fire protection equipment and associated devices.
   4. Life Safety Systems
      a. Fire alarm initiation and notification devices.

C. Communication and Temperature Control Systems
   1. Telephone and Data Communications
      a. Boxes and empty raceways with pull wires stubbed to the nearest accessible ceiling. Sleeves through all non-accessible ceiling areas and through wall penetrations.
      b. Voice and Data cabling, jacks, cross-connect and termination hardware including patch panels and floor mounted racks.
   2. AV Systems
      a. Power, conduits and back-boxes for AV systems. AV equipment and installation will be a separate bid package.

1.02 RELATED SECTIONS

A. 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.

1.03 ALTERNATES

A. Refer to Section 01 23 00 for a list of alternates.

PART 2 - PRODUCTS

2.01 Not Used

PART 3 - EXECUTION

3.01 Not used

END OF SECTION

SECTION 26 01 00
GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. These specifications set forth conditions, and include the work to be performed, equipment to be installed, and certain methods to be employed to implement a complete and operable electrical installation. This specification shall apply to all electrical work to be performed as listed in Section 26 00 00 Electrical Scope of Work as well as any other electrical work required of other trades or by Sections of this Project Manual.

B. Related Documents

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.

1.02 REFERENCES

A. National Fire Protection Agency:

1. NFPA 70 - National Electrical Code
2. NFPA 72 – National Fire Alarm Code
3. NFPA 101 - Life Safety Code

B. State of Wisconsin Department of Commerce

1. PSC 114 – Electrical Code, Volume 1
2. Chapter ILHR 16 – Electrical Code, Volume 2
3. Chapter ILHR 63 - Energy Conservation
4. Chapter ILHR 73 – Illumination Code

C. Local Code and Inspector Requirements

D. Local Utility Service Rules and Requirements

1.03 CODES AND STANDARDS

A. Comply with Section 01 42 00 – Reference Standards.

B. Specific naming of codes or standards occurs on the Drawings, and in other Sections of these Specifications.

C. These specifications are minimum requirements and shall govern except where made more stringent by other sections of this specification or local, state or federal laws or regulations. Where conflict between drawings, specifications, codes or standards occurs, the more stringent requirements shall govern. No extra compensation for such compliance will be allowed.

D. Submission of proposal is considered evidence that the Contractor is proficient and experienced, and knowledgeable of all standards, codes, ordinances, permits and regulations affecting his work.

1.04 PERMITS, INSPECTIONS, AND UTILITY CONNECTIONS

A. The Contractor shall prepare and submit all applications and working drawings, as required by the General Conditions and the Supplemental/Special Conditions, to the authorities having jurisdiction over the project. All licenses and permits shall be secured and paid for by the Contractor in accordance with the General and Supplemental/Special Conditions of the project.

1.05 EXAMINATION OF PLANS, SPECIFICATION, AND SITE

A. Before submitting a bid the contractor shall be familiar with all features of the building and site which may affect the execution of his work. No additional payment will be allowed for work resulting from the failure to obtain this information. The contractor shall clarify any omissions or errors in the plans specifications with architect or engineer before submitting his bid.

1.06 DRAWINGS

A. The drawings depicting electrical work are diagrammatic and show symbols representing electrical equipment and devices in their approximate location. The exact location of such equipment and devices shall be established in the field in accordance with instructions from the Architect/Engineer and as established by manufacturer's installation drawings and details.

1. Coordinate the location of equipment and devices with the other trades performing work in the area.
2. The location of receptacles and electrical connections for equipment to be installed by others are indicated on the plans. Verify the exact location and configuration of the connection with the party responsible for the installation of such equipment.
3. Refer to shop drawings and submittal drawings for all equipment requiring electrical connections to verify rough-in and connection details.
4. Dimensions noted on the electrical drawings are subject to measurements of adjacent and previously completed work.
5. Dimensions shall not be derived by scaling drawings.

B. The Contractor shall keep a detailed set of record drawings in accordance with Section 01 71 16. The record drawings shall include all conduit and feeder runs, pull box locations, and any other deviations from the Contract Drawings.

1.07 SUBMITTALS AND SUBSTITUTIONS

A. Comply with Section 01 33 00 – Submittal Procedures in addition to the following requirements.

B. Comply with the specific submittal requirements of each specification section in addition to the following requirements.

C. Approval of equipment, fixtures, methods, etc. proposed as alternates to those called for in the plans may be obtained by the following process. Consideration of alternate equipment shall be solely at the discretion of the Engineer. No alternates to the plans and specifications will be accepted except those given prior approval as follows.

1. Any and all proposed alternate equipment, fixtures, methods, etc. must be submitted for approval not less than ten (10) days prior to bid due date. Submittals shall be equivalent to those required for review as noted in section B below.
2. After review of the submittals the Engineer will determine acceptability of alternate proposals. All acceptable alternates will be made known to prospective contractors through the means of communication deemed best by the Engineer.

D. Submit all materials and equipment for review. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:

1. Submit schematics and connection diagrams for all electrical equipment. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted unless it is clearly marked to show the intended connections. Sequence of operation shall be worded to indicate the progression of operation of all pushbuttons, limit switches, relays, solenoids and all other control devices.
2. Equipment and materials descriptive literature not readily cross-referenced with the drawings or specifications shall be identified by a suitable notation.

3. Lamp fixture descriptive sheets shall show the fixture schedule letter, number, or symbol for which the sheet applies.
4. Product sheets showing UL approved systems & materials for fire stopping. Identify the fire wall or floor where the product will be applied.
5. Sheets or drawings showing more than the particular item under consideration shall have crossed out all but the pertinent description of the item for which review is requested.
6. Equipment and materials descriptive literature and drawings shall show the specification paragraph for which the equipment applies.
7. The Contractor shall submit within thirty (30) days of the award of the contract for the Engineer's approval and prior to any purchase of the items, six (6) copies of materials, equipment, devices (including outlets and switches), conduit and wire, and fixtures proposed to be incorporated within the work. Where manufacturers are indicated for an item in the specification, only designation by catalog number of the manufacturer of the item to be used shall be required. All other items shall be listed with catalog numbers and descriptive information. The list must be complete to receive consideration. Items judged by the Engineer to be in non-conformance may be rejected. Shop Drawings of panelboards, switches over 35 amp rating, and special equipment will be required prior to their approval.
8. The Contractor shall review all shop drawings prior to submission.
   a. The Contractor shall verify that the materials and equipment depicted will properly fit into construction.
   b. The Contractor shall review all previously completed work related to the installation of the equipment depicted to insure that it has been properly installed.
9. No materials or equipment subject to prior review by the Architect/Engineer shall be fabricated or installed by the Contractor without approval. The Architect/Engineer's review of the shop drawings does not relieve the Contractor of the responsibility of deviations from the requirements of the drawings and specifications, unless prior written approval for such deviations has been granted.

1.08 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall assemble and submit to the Architect/Engineer for subsequent submission to the Owner, complete Operation and Maintenance manuals in accordance with Section 01 78 23 for each of the Lighting, Electrical, Communications, and Alarm systems.

B. The manuals shall consist of bound volumes instructing the Owner's personnel in the use, operation, and maintenance of the system or piece of equipment to which the manual pertains. The manual shall include the items specified in Section 01 78 23 and in the specific Specification Section for the equipment or system. The manuals shall cover all phases of operation and maintenance and shall be illustrated with drawings, photographs, wiring diagrams etc. as necessary.

C. Each manual shall include two sets of final shop drawings depicting the equipment or system as installed.

1.09 TEMPORARY FACILITIES

A. Comply with the requirement of Section 01 50 00 Temporary Facilities/Controls.

B. The Electrical Contractor shall provide all labor and material for temporary power and lighting required in construction for all trades until the permanent system is in operation.

C. The Electrical Contractor shall include the following facilities in the temporary power and lighting service for the entire project:
   1. For general temporary lighting in construction areas, provide an average maintained level of not less than 10fc. Provide not less than 100 watt incandescent lamps in

corridors and similar traffic ways, spaced not more than 50 feet apart, except provide one (1) lamp at each stairway or ladder landing.

2. Temporary lighting system shall be circuited and controlled so that the lighting level in each portion of the building can be reduced to provide security lighting during non-working hours and on weekends and holidays. The level of lighting for security purposes shall be in accordance with all federal, state and local regulations. The Electrical Contractor shall be responsible for the control of the temporary lighting such that the lighting is turned on at the beginning of each workday and the normal working lighting is reduced to the security lighting level at the end of each workday.
3. After installation of the permanent lighting system, it may be used for construction lighting as required.
4. Complete installation shall be in compliance with all applicable codes. Electrical Contractor's bid will allow removal and salvage for any temporary service when it is no longer required.

1.10 NEGLIGENCE

A. Should the electrical contractor fail to provide materials, templates, or other necessary information causing delay or expense to another party, he shall pay the actual amount of the damages to the party who sustained the loss.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Material and equipment shall be furnished new.

B. All material and equipment shall be listed by Underwriters' Laboratories, Inc. and shall bear UL listing labels where a UL test or standard exists.

C. Products shall be by established manufacturers regularly engaged in making type of materials to be provided and complete with all parts, accessories, trimmings, connections, etc. reasonably incidental thereto as specified in detail or as described in manufacturer's catalog. All equipment shall be properly cleaned, adjusted, and put in complete working order ready for service.

2.02 SUPPORTING DEVICES

A. Channel Support Systems
   1. U-Channels: Roll formed from 12-gauge steel. U-Channel width 1.5/8", height shall be sized for the application of the channel and the device it supports.
      a. Channel for indoor, dry application shall have one of the following finishes.
         i. Pre-Galvanized Zinc Coating – ASTM A525 G-90
         ii. Finish equal to B-Line Dura-Green®™ or Unistrut Perma-Green®™
      b. Channel for outdoor, wet and damp application shall have Hot-Dipped Galvanized After Fabrication – ASTM A123 finish.
   2. Fittings and accessories:
      a. Fittings and accessories shall be manufactured by the U-Channel manufacturer.
      b. Indoor, dry application finish: Electro-plated Zinc – ASTM B633.
      c. Outdoor, wet, and damp application finish: Hot-Dipped Galvanized After Fabrication – ASTM A123.

B. Fastening Hardware including screw, bolts, nuts, washers, etc. shall be stainless steel in outdoor, wet or damp locations.

C. Concrete or masonry anchoring systems shall be applied per manufacturer's recommendations for base material and load applications.

2.03 FIRESTOPPING

A. Provide Firestopping systems that comply with ASTM E-814 and UL 1479.

B. Firestopping systems shall provide a fire resistance rating equal to the hourly resistance rating of the floor, wall, or partition in which the system is installed.

C. Application and installation of firestopping products shall be in strict compliance with the manufacturer's instructions.

D. Acceptable manufacturers: Nelson Firestop Products, Tremco, RectorSeal and CSD Sealing Systems.

2.04 ACCESS PANELS

A. All access panels required by code or otherwise to electrical service equipment shall be supplied and installed by Electrical Contractor.

PART 3 - EXCECUTION

3.01 EQUIPMENT INSTALLATION REQUIREMENTS

A. Install all components, level, plumb, and parallel and perpendicular to other building system components, except where specifically noted.

B. Install all equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnection with minimum interference of installation with other systems.

C. Coordinate equipment locations with equipment and systems installed by other trades. Where a conflict arises, notify the Architect/Engineer and obtain approval for an alternate location before proceeding with installation.

D. Verify equipment dimensions to insure dimensional compatibility.

3.02 CUTTING AND PATCHING

A. Comply with the requirements of Section 01 73 29

B. Cutting and patching shall not impair the strength or function of work being cut, i.e. structural members shall not be weakened, and holes through exterior walls shall be waterproofed.

C. No structural members shall be cut without prior approval from the Architect/Engineer.

1. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.03 FIRESTOPPING

A. All penetrations through walls, floors, and partitions shall be sealed.

B. Sealants and sealing systems shall restore the fire resistive rating of the wall, floor, or partition that is penetrated.

3.04 TRENCHING

A. Cover Material of trench

1. Cover Material: Unwashed bank-run sand or crushed bank-run gravel consisting of durable particles ranging in size from fine to coarse in a substantially uniform combination. Conform to the following gradation:

Cover Material	
Percent Passing	
Sieve Size	By Weight
1 Inch	100
3/4 Inch	85-100
No. 4	35-65
No. 40	15-35
No. 200	5-15

2. Base Material:
   a. Excavated Material: Natural soils classified in ASTM D 2487 as Gravels (GW, GP GM and GC), Sands (SW, SP, SM and SC) and Silts and Clays (ML and CL). Silts and Clays classified as OL, MH, CH, OH, and PT are not acceptable unless specifically allowed by Architect/Engineer. Soil material shall be free from vegetable or other organic matter, trash, debris, stones larger than three inches and frozen material.
3. Backfill Material:
   a. Raising Site Grades: Silty Clay with moisture content of 2 to 3 percent of optimum moisture content. Lifts not to exceed 6" in loose thickness and compacted to a minimum 95%.
   b. Final Inches of Fill Material: Not more than 5% passing No. 200 sieve.

B. Backfilling
1. Backfill trenches to contours and elevations with unfrozen materials.
2. Do not backfill over wet, frozen or spongy sub-grade surfaces.

3.05 TESTS

A. The Electrical Contractor shall conduct all tests required to ensure proper installation and operation off all components of the electrical system. The Electrical Contractor shall provide all instrumentation and labor necessary to conduct these tests. The engineer may require that he or his authorized representative be present for any required test.

B. During the course of construction, conduct the following tests, tabulate data, date, sign and submit to the Engineer. Further tests may be required to ensure proper operation of the electrical system.
1. Standard megger insulation test on each feeder.
2. Ground resistance test.
3. Check motors for proper rotation.
4. Ensure that all phase conductors are entirely free from grounds and short circuits.
5. Test the ground fault protection equipment of switchboards before temporary service is removed. Obtain test procedure from manufacturer and review procedure with the Architect/ Engineer before conducting the test.
6. Circuits shall be phased out and loads shall be balanced within ±7 1/2% on each phase. Clamp ammeter test on each feeder conductor with all utilization equipment energized. The load current in each phase conductor of the feeder or the portion thereof supplying the panel shall not differ from the average connected load currents in the feeder conductors by more than 7½%. If the load current does differ by more than 7½%, the Contractor 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. Upon completion of project, adjust all voltage taps on transformers for an optimum operating level. Aim all adjustable lighting fixtures. Adjust all auxiliary systems for optimum performance.

3.06 PLACING OF SYSTEMS IN OPERATION

A. The Electrical Contractor shall be responsible for all start-up procedures and system checks.

B. All equipment shall be installed, tested and operated in accordance with the respective manufacturer's recommendations.

3.07 GUARANTEES

A. All labor, materials and equipment shall be guaranteed in writing by installing contractor for one year after final acceptance date and/or normal continuous complete season's operation applicable to equipment or system.

B. Acceptance date shall be determined by Architect/Engineer and stated in writing. Contractor shall secure equal guarantees from suppliers.

C. Contractor shall make all necessary alterations, repairs, adjustments and replacements during guarantee period as directed by Architect/Engineer to comply with Contract Documents, at no cost to the Owner.

D. Repair or replacements made under the guarantee provision shall bear further one-year guarantee from date of acceptance of repair or replacement.

3.08 INSPECTION

A. Upon completion of the work described under these specifications and drawings, the Electrical Contractor shall obtain and pay for inspection and approval by the local electrical inspecting authority or the State of Wisconsin. One (1) certified copy of the inspection report shall be delivered to the Architect/Engineer.

3.09 HOUSEKEEPING AND CLEANUP

A. Daily remove from the site all debris and rubbish accumulating as a result of the electrical installation. Upon completion of the project, dispose of all debris and rubbish and leave manholes and electrical equipment rooms broom clean. Clean the interiors of all cabinets, pull-boxes and equipment enclosures.

3.10 PRODUCT HANDLING

A. Protection: Equipment shall be constructed and packaged to withstand all stress induced in transit and during installation.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

3.11 DISCREPANCIES

A. In the event of discrepancy, immediately notify the Architect/ Engineer.

B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.12 START-UP ASSISTANCE

A. The Electrical Contractor shall provide electricians to assist with the equipment start-up, including but not limited to, the following:

1. Vacuum and blow out all electrical panels.
2. Change motor rotation as required.
3. Exchange wires on terminal strips.
4. Increase overload element sizes when required by the engineer.

5. Measure and record all motor-running currents.
6. Correct all wiring errors.

END OF SECTION

SECTION 26 05 02
MINOR ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Minor electrical demolition work for remodeling.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on field observation and existing record documents. Report discrepancies to Architect before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

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

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

C. Existing Electrical Service: Maintain existing system in service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

D. Existing Telephone System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner Architect and Telephone Utility Company at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work as indicated on Drawings.

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

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned boxes which are not removed.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and

other accessories.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

J. Extend existing installations using materials and methods [compatible with existing electrical installations, or] as specified.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry.

3.05 INSTALLATION

A. Install relocated materials and equipment as indicated in other Specification sections and on the Drawings.

END OF SECTION

SECTION 26 05 19
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section encompasses the selection and installation of wire and cable for all types of applications.

B. Related Documents

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. Section 26 01 00 - General Electrical Provisions.
3. Section 26 05 33 – Raceways and Boxes.
4. Section 26 05 53 - Electrical Identification.

1.02 REFERENCES

A. Federal Specifications (Fed. Spec.):

1. J-C-30A(1) Cable and Wire Electrical (Power, Fixed Installation).

B. Underwriters Laboratories, Inc. (UL) Publications:

1. No. 44 Rubber-Insulated Wire and Cables.
2. No. 83 Thermoplastic-Insulated Wires.
3. No. 493 Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables.

1.03 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.

B. Comply with Section 26 01 00 - General Electrical Provisions.

C. Provide product data from the cable manufacturer.

1.04 DELIVERY AND STORAGE

A. Provide cable on original reels or in boxes, new and unused.

B. Store cables in dry protected area and protect cable ends in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Low Voltage, Lighting and Power Cables:

1. Conductors provided on 600 volt power and lighting systems to be stranded per ASTM B 8 soft drawn copper for wires sizes 8 AWG through 14 AWG and stranded soft drawn copper per ASTM B 8 for 6 AWG wire sizes and larger.
2. Insulation system shall be type THHN, THWN or XHHW, 75°C min., rated 600V as defined and listed in Article 310 of NEC.
3. Minimum size conductor utilized shall be #12 AWG for lighting circuits and #12 AWG for power circuits.
4. Acceptable manufacturers are Anaconda, Essex, ITT Royal, Southwire, Triangle, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lighting and Power Cables:

1. Install only after completion of work which might cause damage to wires or conduit.
2. Clean out or replace conduit in which dirt, water, concrete, or other foreign matter has been allowed to accumulate, before installing wiring.
3. Identification of Insulated Conductors: Mark on outer cover giving voltage, type, and size. In addition, identify each end of each conductor wire with marking tape or sleeve as described in Section 26 05 53 - Identification.
4. Splices:
   a. No wire splices allowed in entire length of conduit or raceway.
   b. Make splices in electrical enclosures.
   c. Splice Insulation: Equal to original factory insulation.
   d. Splicing Copper to Aluminum: Use aluminum-copper connections, approved as suitable for the purpose.
5. Termination of Conductors:
   a. Insulated type compression lugs, "Sta-Kon" type by Thomas & Betts.
   b. At distribution equipment containing aluminum bus bars use aluminum-copper lugs rated and approved for the application.
   c. For lighting and receptacle circuits use "Scotchlox Spring" connectors manufactured by 3M.

B. Lace or clip groups of feeder conductors at distribution centers, pullboxes, and wireways.

C. Use wire pulling lubricant listed by UL for pulling No. 4 AWG and larger wire. Do not pull cables through conduit with more than allowable bends specified in NEC 345-11.

D. Limit the number of conductors in boxes so that the maximum number does not exceed the number permitted by Tables 370-6 of the National Electrical Code.

E. Support conductors in vertical raceways in accordance with the National Electrical Code. Cable supports shall be O-Z/Gedney Type "R".

F. Provide dedicated neutrals for each branch circuit.

G. Wiring for emergency systems shall be installed in separate conduit runs.

END OF SECTION

SECTION 26 05 26
GROUNDING SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers the selection and installation of the equipment for an effective grounding system.

B. Related Documents

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.

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE Standard 142-1972 - Grounding.

B. National Fire Protection Association (NFPA) Publications:

1. NEC Article 250.

C. Underwriters Laboratories Inc. (UL) Publications:

1. UL-No. 467.

1.03 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.

B. Certified test reports on cable and ground rods.

C. Ground resistance tests.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Ground Connections:

1. Shall be exothermic weld when concealed.
2. Shall be mechanical where exposed to view.
3. Where the grounding conductor penetrates a concrete surface use a 5/8 inch solid copper-weld rod or a thermo-weld anti-siphon water stop.

B. Grounding electrode shall be soft drawn stranded copper sized in accordance with Section 250 of the NEC. Solid may be used where penetration of a concrete surface is required.

C. Acceptable manufacturers are Cadweld, 0-Z Gedney, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground all metallic conduits, cable trays, supports, cabinets and equipment in accordance with the National Electrical Code. Ground wire shall be of the same kind and quality as other conductors in the building, shall be placed in steel conduit runs as specified for branch circuits, and shall be sized to meet the requirements of the National Electrical Code.

B. Test ground resistance with a ground meter of bridge type and report results to Architect/Engineer. Drive additional rods as directed by Architect/Engineer. Additional rods will be paid for as an extra. The system resistance should not exceed 5 OHMS.

C. Grounding conductors shall be attached to equipment by means of approved copper alloy solder-less grounding lugs or clamps which shall be attached to the equipment and the grounding point by means of hexhead cap screws or machine bolts after the contact surfaces have been cleaned to bright metal.

D. Ground conductors run in conduit with circuit conductors shall be securely connected inside the junction boxes or enclosures. Ground conductors terminating at the motor control centers and switchgear, shall be terminated at the ground bus. Splices in ground conductors shall be made by the "Cadweld" process by Erico Products, Inc., Continental Industries "Thermoweld", or equal.

E. Ground straps shall be supported at intervals not exceeding two (2) feet by means of round head bronze machine screws and approved type anchors.

F. Flexible or nonmetallic conduit will not be approved for continuity in a grounding system. A separate ground wire shall be installed and bonded to conduit system on both sides of flexible conduit. A separate ground wire shall be installed in all non-metallic conduit. Ground motor bases and frames pulling a separate conductor in with the motor feeder.

G. Install a bonding jumper around expansion fittings to maintain continuous ground continuity.

H. All power feeds to panels, motors, etc. shall contain a ground conductor sized according to the NEC. The conduit system shall not be considered an acceptable ground.

I. All branch feeds to lights, receptacles, equipment, and general distribution shall contain a ground conductor sized according to the NEC. The conduit system shall not be considered an acceptable ground.

END OF SECTION

SECTION 26 05 33
RACEWAY AND BOXES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Raceways include the following:
   1. Rigid metal conduit.
   2. Intermediate metal conduit.
   3. Electrical metallic tubing (EMT).
   4. Flexible metal conduit.
   5. Liquidtight flexible conduit.
   6. Rigid nonmetallic conduit.
   7. Wireway.

C. Boxes, enclosures, and cabinets include the following:
   1. Device boxes.
   2. Outlet boxes.
   3. Pull and junction boxes.
   4. Cabinets and hinged cover enclosures.

D. Related Documents
   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. Section 26 01 00 - General Electrical Provisions.
   3. Section 26 27 26 - Wiring Devices.
   4. Section 26 05 53 - Electrical Identification.

1.02 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.

B. Comply with Section 26 01 00 - General Electrical Provisions.

C. Product data for wireway and fittings, floor boxes, hinged cover enclosures, and cabinets.

D. Shop drawings for nonstandard boxes, enclosures, and cabinets. Include layout drawings showing components and wiring.

1.03 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
   1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.

C. Comply with NECA "Standard of Installation."

D. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Products that may be incorporated in the Work include, but are not limited to, the following:

1. Metal Conduit and Tubing:
   a. Allied Tube and Conduit, Grinnell Co.
   b. Anamet, Inc., Anaconda Metal Hose.
   c. Anixter Brothers, Inc.
   d. Carol Cable Co., Inc.
   e. Cole-Flex Corp.
   f. Flexcon, Inc., Coleman Cable Systems, Inc.
   g. Spiraduct, Inc.
   h. Triangle PWC, Inc.
   i. Wheatland Tube Co.
2. Nonmetallic Tubing and Conduit:
   a. Anamet, Inc., Anaconda Metal Hose.
   b. Breeze-Illinois, Inc.
   c. Carlon.
   d. Certainteed Corp, Pipe & Plastics Group.
   e. Hubbell, Inc., Raco, Inc.
   f. Spiraduct, Inc.
   g. Thomas & Betts Corp.
3. Conduit Bodies and Fittings:
   a. Scott Fetzer Company, Adalet-PLM.
   b. American Electric, Construction Materials Group.
   c. Emerson Electric Co., Appleton Electric Co.
   d. Carlon.
   e. Hubbell, Inc., Killark Electric Manufacturing Co.
   f. General Signal, O-Z/Gedney Unit.
   g. Thomas and Betts Electrical Components Group.
4. Wireway:
   a. Hoffman Engineering Co.
   b. Keystone/Rees, Inc.
   c. Square D Co.
5. Boxes, Enclosures, and Cabinets:
   a. Scott Fetzer Company, Adalet-PLM.
   b. Butler Manufacturing Co., Walker Division.
   c. Cooper Industries, Midwest Electric.
   d. Erickson Electrical Equipment Co.
   e. Hoffman Engineering Co., Federal-Hoffman, Inc.
   f. Hubbell Inc., Killark Electric Manufacturing Co.
   g. General Signal, O-Z/Gedney.
   h. Raco, Inc., Hubbell Inc.
   i. Robroy Industries, Inc., Electrical Division.
   j. Square D Co.
   k. Thomas & Betts Corp.

B. Metal Conduit and Tubing

1. Rigid Steel Conduit (GRC, RSC): ANSI C80.1.
2. Intermediate Metal Conduit (IMC): ANSI C80.6.
3. Electrical Metallic Tubing (EMT) and Fittings: ANSI C80.3 with set-screw or compression-type fittings.
4. Flexible Metal Conduit: Zinc-coated steel.
5. Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.
6. Fittings: NEMA FB 1, compatible with conduit/tubing materials.

C. Non-metallic Conduit and Tubing
   1. Electrical Nonmetallic Tubing (ENT): Not an acceptable raceway, shall not be used.
   2. Rigid Nonmetallic Conduit (RNC): NEMA TC 2, Schedule 40 or 80 PVC.
   3. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

D. Wireways
   1. Material: Sheet metal sized and shaped as indicated.
   2. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.
   3. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.
   4. Finish: Manufacturer's standard enamel finish.

E. Outlet and Device Boxes
   1. Sheet Metal Boxes: NEMA OS 1.
   2. Cast Metal Boxes: NEMA FB 1, type FD, cast feralloy box with gasketed cover.
   3. Nonmetallic Boxes: NEMA OS 2.

F. Pull and Junction Boxes
   1. Small Sheet Metal Boxes: NEMA OS 1.
   2. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

G. Cabinets and Enclosures
   1. Hinged Cover Enclosures: NEMA 250, steel enclosure with continuous hinge cover and flush latch. Finish inside and out with manufacturer's standard enamel.
   2. Cabinets: NEMA 250, type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 WIRING METHODS

A. Indoors: Use the following wiring methods:
   1. Minimum conduit size to be 1/2".
   2. Conduits 1 1/4" diameter and smaller may be EMT where allowed by other paragraphs in this section.
   3. Conduits 1 1/2" and greater shall be IMC or GRC except where flexible conduit is allowed by other paragraphs in this section.
   4. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquidtight flexible metal conduit.
   5. Damp or Wet Locations: Rigid steel conduit.
   6. Exposed:
      a. Below 8'-0" above finished floor: Rigid or intermediate metal conduit.

b. Above 8'-0" above finished floor: Electrical metallic tubing.

7. Concealed in walls and above ceilings: Electrical metallic tubing.
8. Conduit fittings:
   a. RMC and IMC shall have threaded fittings.
   b. EMT shall have steel compression fittings except set screw fittings will be accepted for ½" and ¾" raceways.
9. Boxes and Enclosures: NEMA Type 1.
10. Use of Type MC cable is not an acceptable installation unless specifically approved by the engineer.

3.03 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Use of plastic anchors must be pre-approved by project engineer.

C. Conceal conduit and EMT within walls, ceilings, and floors except where specifically noted in the plans and specifications.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Use temporary closures to prevent foreign matter from entering raceway.

H. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

I. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings.

J. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated.

K. Do not embed raceways slabs.

L. Install raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
   1. Run parallel or banked raceways together, on common supports where practical.
   2. Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

M. Join raceways with fittings designed and approved for the purpose and make joints tight.
   1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
   2. Use insulating bushings to protect conductors.

N. Tighten set screws of threadless fittings with suitable tool.

O. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

P. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

Q. Install pull wires in empty raceways. Use No. 14 AWG (1.6 mm) zinc-coated steel or monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull wire.

R. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
2. Where otherwise required by the NEC.

S. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

T. Install hinged cover enclosures and cabinets plumb. Support at each corner.

U. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.05 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section provides the minimum requirements for the identification of the components of the electrical system.

B. Related Documents

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. Section 26 01 00 - General Electrical Provisions.

1.02 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Nameplates shall be 1/8" 5-ply laminated with 1" high white letters on a black background.

B. Wire and cable markers shall be permanently attached cloth, split sleeve, or tubing type.

1. The identification shall be printed on the marker; write-on markers are not acceptable.
2. Include the branch circuit number, control circuit or any other appropriate identification that will expedite future tracing and trouble shooting.

C. Tape for wire color coding shall be thermo-plastic adhesive tape.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Identify switchboards, panelboards, individual circuit breakers, enclosed switches, motor starters and other electrical enclosures using engraved laminated plastic nameplates, specified above, as follows:

1. Switchboards and panelboards with panel number, voltage, phase, and amperage.
2. Motor starters, individual circuit breakers in switchboards and MCCs, and enclosed switches with equipment served (0.75" high letters).
3. Other enclosures with equipment and location being served.

B. Equip each distribution, lighting, and lighting control panel with a clear plastic covered typewritten directory accurately indicating rooms and/or equipment being serviced.

C. All electrical systems shall be color coded per National Electrical Code.

1. 208Y/120 Volt Systems:

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green (or bare copper)
Isolated Ground	Green with one yellow stripe

2. 480Y/277 Volt Systems:

Phase A	Yellow
Phase B	Brown

Phase C	Orange
Neutral	Gray
Ground	Green (or bare copper)
Isolated Ground	Green with one yellow stripe

3. Wire sizes #10 and smaller shall have color coded insulation the full length of the wire.
4. Wire size #8 and larger shall be identified with the appropriate color tape at all switchboards, panelboards, junction boxes, motor terminals, and any other enclosure where phase identification is necessary.

D. Wires in each junction box, panelboard, disconnect, enclosure or outlet shall be labeled with wrap-on numbers according to the circuit number to which they are connected.

E. When wire of different systems junction in a common box, each cable shall be grouped with its own system and identified using tags or identification strips.

F. When a piece of equipment is fed from more than one electrical source or more than one disconnect switch must be off to completely disconnect the equipment provide signs at each disconnect warning of this hazard.

G. Identify all mechanical and electrical items with item, panel and circuit number.

H. An underground warning marker shall be placed above buried cables and conduits the full length of the trench at a depth of 6" below grade.

I. Identify all non standard receptacles and multi-switch lighting controls as follows:
   1. Provide non-standard receptacles with engraved stainless steel plates identifying the equipment being served and the Nema configuration of the device.
   2. Line voltage multi-switch lighting controls shall be labeled using engraved or stamped plates.
   3. Low voltage multi-switch lighting controls shall be labeled using factory provided label holders, or using stamped or engraved plates.

J. Identify all telecommunications cables, jacks, outlets, and components following the recommendations of BICSI to match building standard.

END OF SECTION

SECTION 26 09 00
LIGHTING CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system and a central dimming controller, as described herein.

B. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.

C. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

D. Related Documents

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. Section 26 01 00 - General Electrical Provisions.
3. Section 26 05 33 - Raceway and Boxes.
4. Section 26 05 53 - Electrical Identification.

1.02 SUBMITTALS

A. Occupancy Sensors

1. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.
2. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.
3. Submit any interconnection diagrams per major subsystem showing proper wiring.
4. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.
5. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

B. Central Dimming Controller

1. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers.
2. Schematic of system.
3. Product Data: Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

1.03 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Comply with FCC Regulations of Part 15, Subpart J for Class A.

C. Comply with NEC as applicable to electrical components and wiring.

D. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with

specifications. The supplier's obligation shall include repair or replacement, and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the substantial completion of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site dry and in their original unopened containers with all labels intact and legible at the time of use.

B. Store in strict accordance with manufacturer's recommendations and as approved by the Architect/Engineer.

C. Store materials in a dry location, off the floor.

1.05 WARRANTY

A. Provide Manufacturer's Warranty for Central Dimming Controller:
   1. Standard 2-year warranty, Includes:
      a. 100 Percent Replacement Parts for Manufacturer Lighting System Components
      b. 100 Percent Manufacturer Labor Coverage to Troubleshoot and Diagnose a Lighting Issue
      c. First–Available Onsite or Remote Response Time
      d. 24 Hours Per Day, 7 Days Per Week Telephone Technical Support, Excluding Manufacturer Holidays
      e. Remote Diagnostics for Applicable Systems

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any price quotations received and submittals made are for sensors which meet or exceed the specifications included herein. Subject to compliance with requirements, provide products by one of the following:
   1. Occupancy Sensors
      a. Wattstopper
      b. Hubbell Building Automation
      c. Leviton
   2. Central Dimming Controller
      a. Basis of design product: Lutron QS or subject to compliance and prior approval with specified requirements of this section.

2.02 OCCUPANCY SENSORS

A. 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.

B. 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.

C. Wall switch products shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.

D. 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.

E. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.

F. 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.

G. Passive infrared sensors shall utilize Pulse Count Processing and Detection Signature Processing to respond only to those signals caused by human motion.

H. Passive infrared sensors shall provide high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line).

I. Passive infrared sensors shall have a multiple segmented Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue build-up.

J. Where specified, passive infrared ultrasonic and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.

K. Dual technology sensors shall be wall mounted, corner mounted or ceiling mounted in such a way as to minimize coverage in unwanted areas.

L. 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.

M. 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.

N. Ultrasonic operating frequency shall be crystal controlled at 25 kHz within ± 0.005% tolerance, 32 kHz within ± 0.002% tolerance, or 40 kHz ± 0.002% tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.

O. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.

P. 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.

Q. 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.

R. 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.

S. 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.

T. 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.

U. All sensors shall have UL rated, 94V-0 plastic enclosures.

2.03 Central Dimming Controller

A. Provide system hardware that is designed, tested, manufactured, and warranted by a single manufacturer.

B. Architectural Lighting Controls: Ten-year operational life while operating continually at any temperature in an ambient temperature range of 0 degrees C (32 degrees F) to 40 degrees C (104 degrees F) and 90 percent non-condensing relative humidity.

C. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairmentper IEC 801-2.

D. Dimming Performance Requirements

1. Electrolytic capacitors to operate at least 20 degrees C below the component manufacturer's maximum temperature rating when device is under fully-loaded conditions in 40 degrees C (104 degrees F) ambient temperature.
2. Load Handling Thyristors (SCRs and triacs), Field Effect Transistors (FETs), and Isolated Gate Bipolar Transistors (IGBTs): Manufacturer's maximum current rating minimum two times control's rated operating current.
3. Capable of withstanding repetitive inrush current of 50 times operating current without impacting lifetime of dimmer.
4. Design and test dimmers to withstand line-side surges without impairment to performance.
    a. Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 3,000 amps per ANSI/IEEE C62.41.
    b. Other power handling devices: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 200 amps per ANSI/IEEE C62.41.
5. Utilize air gap off – activated when user selects "off" at any control to disconnect the load from line supply.
6. Power failure memory and dimmer/relay recovery:
    a. When power is interrupted and subsequently returned, within 3 seconds lights will automatically return to same levels (dimmed setting, full on, or off) prior to power interruption.
7. Multiple load type, tested to UL 508 to specifically control incandescent/tungsten, magnetic low voltage, electronic low voltage, neon/cold cathode, digital fluorescent dimming ballasts, fluorescent dimming ballasts, and non-dim loads...
8. Each dimmer to be assigned a load type that will provide a proper dimming curve for the specific light source.
9. Possess ability to have load types assigned per circuit, configured in field.
10. Minimum and maximum light levels user adjustable on circuit-by-circuit basis.
11. Control all light sources in smooth and continuous manor. Dimmers with visible steps are not acceptable.
12. Provide real-time cycle-by-cycle compensation for incoming line voltage variations including changes in RMS voltage (plus or minus 2 percent change in RMS voltage/cycle), frequency shifts (plus or minus 2 Hz change in frequency/second), dynamic harmonics, and line noise. Systems not providing cycle-by-cycle compensation to include external power conditioning equipment to meet these requirements.
13. Each dimmer to incorporate electronic "soft-start" default at initial turn-on that smoothly ramps lights up to the appropriate levels within 0.5 seconds.
14. Line Voltage Dimmers; Meet following load-specific requirements:
    a. Magnetic Low Voltage (MLV) transformer:
        i. Contain circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472, Section 5.11.
        ii. Dimmers using back-to-back SCR construction that could fail open causing DC power to flow into magnetic low voltage load are not acceptable.
    b. Electronic Low Voltage (ELV) transformer:
        i. Dimmer to operate electronic low voltage transformers via reverse phase control. Alternately, forward phase control dimming may be used if dimming equipment manufacturer has recommended specific ELV transformers being provided.

c. Fluorescent electronic dimming ballast: Refer to Light Fixture Schedule for dimming ballast specifications and performance.

2.04 WALL STATIONS

A. Line Voltage Control Unit:

1. Product: Based on GRAFIK Eye QS
2. Preset lighting control with 16-zone override:
   a. Intensity for each zone indicated by means of one illuminated bar graph per zone.
   b. The information screen on the GRAFIK Eye displays a user customizable name or description. When the user presses a zone or scene button, the information screen displays the given zone or scene name.
   c. Each zone and scene to be field customizable to indicate each zone and scene name.
   d. An astronomical time clock automatically calculates the sunrise and sunset for any given location in the world. The user can define automatic events in relation to daily sunrise and sunset times. For example, the lights can turn on 30 minutes before sunset each day and turn off 30 minutes after sunrise each day. Astronomical time clocks also automatically adjust for daylight savings time, allow for special programming for weekends, holidays, and special events.
   e. Astronomical time clock and programmer interface
      i. Provide access to:
         (a.) Scene selections.
         (b.) Fade zone to a level.
         (c.) Fine-tuning of preset levels with scene raise/lower.
         (d.) Lock out scenes and zones.
         (e.) Fine-tuning of light levels with individual zone raise/lower.
         (f.) Terminal block for wired infrared signal input.
         (g.) Enable/disable wall station.
   f. Light intensity with real time energy savings by digital display.
   g. Fade time indicated by digital display for current scene while fading.
   h. Incorporate built-in wide angle infrared receiver.
   i. For temporary local overrides, individual raise/lower buttons to allow zones to be adjusted without altering scene values stored in memory.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Occupancy Sensors

1. It shall be the contractor's responsibility to locate and aim sensors 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.
2. 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.

3.02 FIELD QUALITY CONTROL

A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system.

B. Reports: Prepare written reports of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

C. Visual and Operational Inspections: Include the following inspections:

1. Inspect control components for defects and physical damage, NRTL labeling, and nameplate compliance with current Project Drawings.
2. Verify settings of photoelectric devices with photometer.
3. Exercise and perform operational tests on mechanical parts and operable devices according to manufacturer's instructions for routine functional operation.

D. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following tests according to manufacturer's instructions:

1. Continuity tests of circuits.
2. Operational Tests: Set and operate controls to demonstrate controls in a methodical sequence that cues and reproduces actual operating functions. Include testing of dimming equipment and ambient-light, programmable, and occupancy controls under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

E. Correct deficiencies disclosed by inspections and tests, make necessary adjustments, and retest deficient items. Verify that specified requirements are met.

3.03 ADJUSTING AND CLEANING

A. Occupancy Adjustments: Upon request within 1 year of date of Substantial Completion, make up to 3 on-site visits to Project site to assist in adjusting light levels, making program changes, and adjusting sensors and controls.

B. Repair scratches and mars of finish to match original finish. Clean equipment and devices internally and externally using methods and materials recommended by manufacturers.

3.04 DEMONSTRATION

A. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the scheduled commissioning date. Upon completion of the system fine tuning the factory authorized technician shall provide the proper training to the owner's personnel in the adjustment and maintenance of the sensors and lighting control system.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section encompasses the selection and installation of wiring devices to include:
   1. Line Voltage Wall Switches
   2. Receptacles
   3. Cover Plates

B. Related Documents
   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. Section 26 01 00 - General Electrical Provisions.
   3. Section 26 05 53 - Electrical Identification.

1.02 REFERENCES

A. Underwriters Laboratories Inc. (UL) Publications:
   1. UL-20 Underwriter's Laboratories General Use Snap Switches.

B. National Electrical Manufacturers Association (NEMA) Publications:
   1. WD 1 General Purpose Wiring Devices: National Electrical Manufacturers Association Standards (NEMA).

C. American National Standard Institute (ANSI):
   1. C 73 Series American National Standard Institute (ANSI) American Standards on Plugs and Receptacles.

1.03 SUBMITTALS

A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.

B. Product data of all types of items supplied.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wall Switches
   1. Lighting and other flush switches shall be specification grade, quiet operating, toggle type in totally enclosed base of the following make and catalog number or approved equal:
      a. Single Pole 20 amp 120/277V Hubbell No. 1221
      b. Two Pole 20 amp 120/277V Hubbell No. 1222
      c. Three Way 20 amp 120/277V Hubbell No. 1223
      d. Four Way 20 amp 120/277V Hubbell No. 1224
   2. Color shall be light almond.
   3. Reference to Hubbell devices has been used as a means of establishing the grades and types of devices for use on the project. Comparable devices of Bryant, Leviton, or Pass & Seymour, Inc. will be acceptable.

B. Receptacles:

1. Standard Duplex Receptacle: Full gang size, specification grade, polarized, duplex, parallel blade, grounding slot, rated at 20 amperes, 120 volts, to conform to NEMA WD-1. Receptacles shall be similar to those as manufactured by Hubbell (No. 5362) or equivalent devices by Bryant, Challenger, or Pass and Seymour.
2. Ground fault receptacle: UL listed Class A with 5 milli-ampere sensitivity 20 ampere 120 VAC rating grounded NEMA 5-20R. Manufactured by Leviton, Hubbell, Square-D, or equal.
3. TVSS receptacle UL listed to standards 1449 and 498. Hubbell 5262S or equal.
4. Color of devices shall be light almond.

C. Cover Plates: Provide for standard switches and receptacles.

1. Material:
   a. Plastic, non-combustible, mar-proof thermosetting material, minimum 0.100" thick.
   b. Steel: Hot dip galvanized, 1.25 oz/sq.ft. minimum.
   c. Cast Metal: Die cast profile, ribbed for strength, flash removed, primed with gray enamel, furnished complete with four mounting screws.
   d. Gaskets: Resilient rubber or closed cell foam urethane.
2. Type Application:
   a. Flush Mounting Plates: Plastic in all areas.
   b. Surface Box Plates: Beveled, steel, pressure formed for smooth edge to fit box.
   c. Weatherproof Plates: Cast metal, gasketed for receptacles.
3. Acceptable manufacturers are Hubbell, Crouse-Hinds, Bryant, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All wiring devices shall be of one manufacturer and shall be delivered to project in original cartons. Devices shall be in accordance with Electrical Symbol Legend.

B. Mounting heights shall be as specified on the drawings.

C. Coordinate switch mounting location with architectural detail.

D. Standard duplex receptacles shall be oriented with the ground opening on top.

E. The outdoor units to be enclosed in cast aluminum boxes with weatherproof cover plates that can be closed with plug in the receptacle.

F. Provide engraved nameplate for receptacle other than standard duplex receptacle.

G. Device plates of the one-piece type shall be provided for all outlets to suit the devices installed; do not use sectional type device plates.

H. Screws shall be of metal with countersunk heads, in color to match the finish of the plates. Screws shall be vertically aligned. Install plates with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices; plaster filling will not be permitted.

END OF SECTION

SECTION 26 28 18
CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section encompasses the selection and installation of circuit breakers in their related enclosures.

B. Related Documents

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. Section 26 01 00: General Electrical Provisions.
3. Section 26 24 19: Motor Starters.
4. Section 25 24 16: Panelboards.

1.02 REFERENCES

A. National Fire Protection Association (NFPA) Publications:
No. 70 National Electrical Code (NEC).

B. National Electrical Manufacturers Association (NEMA) Publications:
No. AB-1 Molded Case Circuit Breakers.

C. Underwriters Laboratories, Inc. (UL) Publications:
No. 489 Molded Case Circuit Breakers and Circuit Breakers Enclosures.

1.03 SUBMITTALS

A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.

B. Product data including applicable shop drawings.

C. Coordination and characteristic curves for circuit breakers.

D. Test reports.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Molded Case Circuit Breakers:

1. Molded case circuit breakers shall have over-center, trip-free, toggle-type operating mechanism with quick-make/quick-break action and positive handle indication. Two- and three-pole breakers shall be common trip.
2. Construction shall be of a rugged, integral housing type molded insulating material, with silver alloy contacts, arc quenchers and phase barriers for each pole.
3. Each circuit breaker shall have a permanent trip unit containing individual non-adjustable thermal and magnetic trip elements in each pole with a common trip bar for all poles and a single operator. Circuit breaker operating handles shall assume a center position when tripped. All breakers shall be calibrated for operation in an ambient temperature of 40°C. Magnetic trip shall be adjustable from 3X to 10X for breakers with 400 ampere frames and higher. Factory setting shall be HI, unless otherwise noted.
4. Breakers shall have removable lugs. Lugs shall be UL Listed for copper conductors. Breakers shall be UL Listed for installation of mechanical screw type lugs or crimp lugs.

5. Circuit breakers in panelboards shall be bolt-on type on phase bus bar and shall have minimum interrupting rating as follows:
   a. 120 volt breakers: 10,000 amperes symmetrical.
   b. 208 and 240 volt breakers: 22,000 amperes symmetrical.
6. Provide ground fault interrupters with 4-6 ma sensitivity.
7. For circuit breakers being added to existing panelboards, coordinate the breaker type with existing panelboards. Modify the panel directory.

B. Acceptable manufacturers are: Square-D, General Electric, Cutler-Hammer/Westinghouse, Siemens, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Circuit breakers to be mounted in enclosures, or panels.

B. Enclosure for circuit breaker shall be properly grounded.

C. Attach handles so as not to interfere with cover plate or door.

D. Properly mount circuit breaker so that acceptable electrical connection is made to bus work.

E. Termination of breaker terminals shall be to industry standards.

F. Installation shall be in accordance with NEC, as shown on the Drawings, and as herein specified.

G. Balance the load on all phases and rearrange branch circuiting if required, for balancing.

END OF SECTION

SECTION 26 50 00
LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

B. Related Documents

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. Section 26 01 00 - General Electrical Provisions

1.02 DEFINITIONS

A. Emergency Lighting Unit: A fixture with integral emergency battery-powered supply and the means for controlling and charging the battery. It is also known as an emergency light set.

B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery-powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units include ones with and without integral lamp heads.

C. Average Life: The time after which 50 percent fails and 50 percent survives under normal conditions.

1.03 SUBMITTALS

A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.

B. Product Data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:

1. Outline drawings indicating dimensions and principal features of fixtures.
2. Electrical Ratings and Photometric Data: Certified results of independent laboratory tests for fixtures and lamps.
3. Battery and charger data for emergency lighting units.

C. Shop Drawings detailing nonstandard fixtures and indicating dimensions, weights, method of field assembly, components, features, and accessories.

D. Wiring diagrams detailing wiring for control system showing both factory-installed and field-installed wiring for specific system of this Project, and differentiating between factory-installed and field-installed wiring.

1.04 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.

1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, and recessed in combustible construction that are specifically listed and labeled for such use.

2. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
3. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Coordinate fixtures, mounting hardware, and trim with ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.

1.05 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty for Batteries: Submit a written warranty executed by the manufacturer agreeing to replace rechargeable system batteries that fail in materials or workmanship within the specified warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, fixtures that may be incorporated into the Work include, but are not limited to, the products specified in the Light Fixture Schedule.

2.02 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass, except as otherwise indicated.
1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: 0.125 inch (3 mm) minimum; except where greater thickness is indicated.

F. Fluorescent Fixtures: Conform to UL 1570.

G. Fluorescent Ballasts: Electronic integrated circuit, solid-state, full-light-output, energy-efficient type compatible with lamps and lamp combinations to which connected.
1. Certification by Electrical Testing Laboratory (ETL).
2. Labeling by Certified Ballast Manufacturers Association (CBM).
3. Type: Class P, high power factor, except as otherwise indicated.
4. Sound Rating: "A" rating, except as otherwise indicated.

5. Voltage: Match connected circuits.
6. Lamp Flicker: Less than 5 percent.
7. Minimum Power Factor: 90 percent.
8. Total Harmonic Distortion (THD) of Ballast Current: Less than 10 percent.
9. Conform to FCC Regulations Part 15, Subpart J for electromagnetic interference.
10. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
11. Multi-lamp Ballasts: Use 2, 3, or 4 lamp ballasts for multi-lamp fixtures where possible.
12. Lamp-ballast connection method does not reduce normal rated life of lamps.

H. High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.

I. HID Ballasts: Conform to UL 1029 and ANSI C82.4. Include the following features, except as otherwise indicated.
1. Constant wattage autotransformer (CWA) or regulating high-power-factor type, unless otherwise indicated.
2. Operating Voltage: Match system voltage.
3. Single-Lamp Ballasts: Minimum starting temperature of minus 30°C.
4. Normal Ambient Operating Temperature: 40°C.
5. Open circuit operation will not reduce average life.

J. Incandescent Fixtures: Conform to UL 1571.

K. Exit Signs: Conform to UL 924 and the following:
1. Sign Colors: Refer to Luminaire Schedule on drawings.
2. Arrows: Include as indicated.
3. Lamps for AC Operation: Light-emitting diodes (LED), 70,000 hours minimum rated life.

L. Self-Powered Exit Signs (Battery Type): Integral automatic high/low trickle charger in a self-contained power pack.
1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.

M. Emergency Lighting Units: Conform to UL 924. Provide self-contained units with the following features:
1. Battery: Sealed, maintenance-free with minimum 10-year nominal life and special warranty.
2. Charger: Minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. Relay disconnects lamps and battery and automatically recharges and floats on trickle charger when normal voltage is restored.

2.03 LAMPS

A. Comply with ANSI C78 series that is applicable to each type of lamp.

B. Fluorescent Color Temperature and Minimum Color-Rendering Index (CRI): 4100 K and 85 CRI, except as otherwise indicated.

C. Non-compact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid start circuits.

D. Metal Halide as specified in Fixture Schedule on drawings.

2.04 FINISHES

A. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to requirements of Division 26 Section "Basic Electrical Materials and Methods."

B. Support for Recessed and Semi-recessed Grid-Type Fluorescent Fixtures: Units may be supported from suspended ceiling support system. Install ceiling support system rods or wires at a minimum of 4 rods or wires for each fixture, located not more than 6 inches (150 mm) from fixture corners.

1. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corner.
2. Fixtures Smaller than Ceiling Grid: Install a minimum of 4 rods or wires for each fixture and locate at corner of ceiling grid where fixture is located. Do not support fixtures by ceiling acoustical panels.
3. Fixtures of Sizes Less than Ceiling Grid: Center in acoustical panel except where located along walls that are oriented at a different angle than the ceiling grid. In this case, position light fixtures in a line parallel to the wall. Support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

C. Provide support for pendant fixtures that is separate from the ceiling grid.

D. Lamping:

1. Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

3.02 CONNECTIONS

A. Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Give advance notice of dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following information in tests of emergency lighting equipment:

1. Duration of supply.
2. Low battery voltage shutdown.
3. Normal transfer to battery source and retransfer to normal.
4. Low supply voltage transfer.

E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

F. Report results of tests.

G. Replace fixtures that show evidence of corrosion during Project warranty period.

3.04 ADJUSTING AND CLEANING

A. Clean fixtures after installation. Use methods and materials recommended by manufacturer.

END OF SECTION

SECTION 27 10 00
COMMUNICATIONS CABLE AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. This section describes the products and execution requirements relating to furnishing and installation of Telecommunications Cabling and Termination Components and related sub-systems as part of a Structured Cabling System.

B. The Horizontal (Station) Cabling System is based on the installation of 4-Pair Unshielded Twisted Pair (UTP) VOICE, Category 6, copper cables. The cables shall be installed from the Standard Voice/Data Outlets to the Storage Room105 and terminated as specified in this document.

C. Station cables shall be installed in conduit in non accessible spaces. Outlets shall be mounted flush in a wall-mounted box.

D. At the Storage Room 105, cable terminations shall be mounted on existing equipment racks.

E. All cables and related termination, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in the following section.

F. The Contractor shall provide all labor and materials necessary to construct the system as described herein. This includes, but is not limited to furnishing and installing cable, cable supports, sleeves, conduit, boxes, racking and termination components, termination, testing, labeling and documentation.

1.02 RELATED DOCUMENTS

A. 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.

B. Section 26 01 00 - General Electrical Provisions.

C. Section 26 05 33 - Raceway and Boxes.

D. Section 26 05 53 - Electrical Identification.

1.03 REGULATORY REFERENCES

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.

B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. Other applicable standards are as follows:

1. ANSI/IEEE C2 - National Electrical Safety Code
2. NFPA 70-2088 - National Electrical Code
3. TIA/EIA Standards 526-14A (OFSPT-14A), 526-7 (OFSPT-7), 568B.1 (Category 5e), 568B.2 (Category 6), 568B.3, 569A, 606A, and 607 (with exception).
4. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
5. ICEA publication S-80-576-2002

1.04 SUBMITTALS

A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.

B. Submit documentation of the contractor's BICSI certified project manager along with bid. Not including clear documentation of BICSI certification will be grounds for rejection of bid.

C. Six (6) sets of Manufacturers Data covering all products proposed indicating construction, materials, ratings and all other parameters identified in Part 2 (Products) below. Four sets of submittals shall be returned to the contractor.

D. Manufacturer's installation instructions, and one (1) two-foot section of each cable type to be sent to the site for final approval by the Engineer. This two-foot section shall have the manufacturer's cable markings visible. Upon request, samples from every reel sent to the site shall be provided.

E. Submittals should be grouped to include complete documentation of related systems, products and accessories in a single submittal. Where applicable, dimensions should be marked in units to match those specified.

F. Submittals shall be original catalog sheets or photocopies thereof. Facsimile (fax) sheets shall not be accepted.

G. Work shall not proceed without the Engineer's approval of the submitted items.

H. If materials are furnished as specified no further qualifications is necessary, except for items requiring shop drawings. However, if the Contractor wishes to substitute another manufacturer and/or catalog number, the following information shall be submitted to the Engineer:

1. A complete description of the material which the contractor proposes to substitute (shop drawings, illustrations, catalog data, performance characteristics, etc.) and the reason for the substitution identifying any benefit to the Owner.
2. The Contractor shall receive approval from the Engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the Engineer.

1.05 PROJECT RECORD DOCUMENTS

A. Submit and record documents under provisions of 26 01 00.

B. Drawings included with the specifications set shall be modified by the contractor to denote as-built information.

C. The drawings are to include equipment rack, cable pathways and SIO locations. SIO locations shall be identified by their sequential number as defined elsewhere in this document. Numbering and drawing conventions used shall be consistent throughout all documentation provided.

D. The Engineer will furnish floor plans in electronic (".dwg", AutoCAD rel. 2004) formats on which as-built construction information can be added. These documents will be modified by the contractor to denote as-built information as defined above and returned to the Engineer for review. This information shall be supplied to the Engineer no later than four (4) weeks prior to the scheduled occupancy of the project.

E. The Contractors shall annotate the base drawings and return to the Engineer in hard copy (same plot size as originals) and electronic (AutoCAD rel. 2004) form.

F. Each drawing submitted by the Contractor as part of the Project Documentation shall be identified as an "As-built" drawing and include the following

1. The Contractor name and/or logo.
2. The date of the drawing.

G. All fonts, color, layer, Model Space/Paper Space conventions established in the base drawings shall be retained by the Contractor in preparation of the As-built drawings.

H. SIO labels and station cable pathways shall be shown on separate layers in AutoCAD.

I. All documentation, including hard copy and electronic forms shall become the property of the City of Madison.

1.06 QUALITY ASSURANCE

A. The manufacturer shall be a company specializing in communication cable and/or accessories with a minimum of five years documented experience in producing cable and/or accessories similar to those specified below.

B. The contractor shall have been in this line of business for a minimum of five (5) years and completed four (4) jobs of the magnitude specified in the following sections.

C. The installing contractor shall have a BICSI certified technician be the project manager. The Certified Installer shall have been trained by a company(s) that offer a minimum fifteen (15) year system warranty.

1.07 WARRANTY

A. This Contractor shall guarantee all materials, equipment, etc., two (2) years from date of substantial completion of this work. In the case of patch panels, station cabling and SIO's the contractor shall furnish complete Category 6 system warranty consisting of no less than fifteen (15) years. This guarantee shall include all labor, material and travel time.

B. In the event of a warranty claim, the owner will contact the section commissioning contractor first to review the item of concern. If corrective action is required, the section cabling contractor will receive direction from the commissioning contractor, and then perform the necessary work to correct the situation. The cabling contractor will then test the work to show conformance with this section. Test results will be submitted to the commissioning contractor for review. All aspects of the commissioning section apply to a warranty claim.

1.08 FINAL PAYMENT

A. Final payment will not be made until the commissioning contractor's certification of commissioning letter is submitted and accepted by the Owner.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver products to and receive products at the site under provisions of Division 1, General Requirements.

B. Cable shall be stored according to manufacturer's recommendations as minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location.

C. If the contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner. If necessary, cable shall be stored off site at the contractor's expense.

1.10 DRAWINGS

A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the Contractor in bidding the job. The Contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.

C. Prior to submitting the bid, the Contractor shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted, within ten (10) days prior to the Bid Due Date.

PART 2 - PRODUCTS

2.01 HORIZONTAL STATION CABLES

A. General

1. The Horizontal Cable System is based on the installation of four (4) pair, Un-shielded Twisted Pair (UTP) Category 6 cables to be installed from the work area to the wiring hub location. Note that the cable count to each Information Outlet location may vary by location.
2. Station Cables shall be constructed of individually twisted pairs with 24-AWG insulated solid copper conductors.
3. All Cables and Termination hardware shall be technically compliant with and installed in accordance with the referenced TIA/EIA documents.
4. All cables shall be suitable for installation in the environment defined and shall have the appropriate NEC rating.
5. Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code and shall meet the specifications of NEMA (low loss), UL 444, and ICEA.
6. Pairs of all 4-pair cables shall be unshielded and shall be identified by a banded color code in which conductor insulation is marked with a dominant color and banded with a contrasting color. By pair number, the pair colors or dominant band are:
   a. Pair 1: Tip - White/Blue; Ring - Blue (or Blue/White)
   b. Pair 2: Tip - White/Orange; Ring - Orange (or Orange/White)
   c. Pair 3: Tip - White/Green; Ring - Green (or Green/White)
   d. Pair 4: Tip - White/Brown; Ring - Brown (or Brown/White)

B. Copper Station Cabling

1. All Station Cables shall terminate on modular Category 6 Patch Panels in their respective Telecommunications Rooms (TR) or Equipment Room (ER) as specified on the drawings.
2. All cables, termination components and support hardware shall be furnished, tested, installed and wired by the Contractor.
3. Transmission characteristics of the Station Cables shall meet full Category 6 performance criteria as defined by the referenced TIA/EIA documents. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Cable is a part.
4. IMPORTANT: Cable and Termination Components (Jack, Patch Panel, Wiring Blocks) are specified to function as a System. The compatibility of the Cable to be installed with the proposed termination components shall be recognized and documented by the Termination Component Manufacturer.
5. The jacket color for Station Cables shall be **BLUE.**
6. Cable shall be packaged in a way that minimizes tangling and kinking of the cable during installation. Examples are open reels or packages that incorporate a rotating reel.
7. Cables installed in a Plenum area shall be Plenum rated.

2.02 STANDARD INFORMATION OUTLET

A. General

1. Station cables shall each be terminated at their designated workstation location in the connector types described in the sub-sections below. These connector assemblies shall snap into a mounting frame and exit at an angle. All ports shall be installed such

that the opening faces the floor. The combined assembly is referred to as the Standard Information Outlet (SIO).

2. SIOs shall be mounted flush in boxes or on surface raceway.
3. The Telecommunications Outlet Frame shall accommodate four Modular Jacks and connectors.
4. The same orientation and positioning of Jacks and Connectors shall be utilized throughout the installation as shown on the drawings.
5. Outlet Faceplates shall incorporate recessed designation strips at the top and bottom of the frame for identifying labels. Designation strips shall be fitted with clear plastic covers.
6. All Jacks and Connectors shall be fitted with a dust cover. Modular Jacks shall incorporate a dust cover that fits over and/or into the jack opening. The dust cover shall be designed to remain with the jack assembly when the jack is in use. No damage to the Jack pinning shall result from insertion or removal of these covers. Dust covers, which result in deformation of the jack pinning, shall not be accepted.
7. Any unused jack positions shall be fitted with a removable blank inserted into the opening.
8. The faceplate of the SIO shall be constructed of High Impact Plastic (except where noted otherwise). Faceplate color shall be light almond to match receptacles in all areas. Confirm faceplate color and material with Engineer prior to ordering faceplates.
9. Wall-mounted SIO's identified on the Floorplan Drawings to accommodate a wall-mounted telephone set shall have a wall plate made from Stainless Steel construction, and accommodate one (1) SIO. Mount on a standard single gang outlet box and include mating lugs for wall phone mounting.
10. All Standard Information Outlets shall be of the same manufacturer throughout the project. An allowable exception, however, is the Wall-mounted telephone set SIO described above.

B. SIO Jack

1. SIO jacks shall be an 8-pin Modular Jack.
2. The interface between the jack and the station cable shall be a 110-Style block or insulation displacement type contact. Termination components shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination
3. SIO Jacks shall be pinned TIA/EIA T568A.
4. Transmission characteristics of the SIO Jacks shall be as required to meet the TIA/EIA Category 6 performance criteria. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Jacks are a part.
5. The Jack shall be UL verified and listed.
6. Jack contacts shall have a minimum of 50 micro-inches of gold plating.
7. The color of the SIO Jack shall be light almond.

2.03 PATCH PANEL

A. Station cabling shall be terminated at the Main Equipment Room and Telecommunications Rooms on panels incorporating Modular Jacks meeting the specifications for the SIO's detailed in the Section above (with the exception that the jack openings shall be vertical, not angled downward).

B. At the Main Equipment Room and Telecommunications Rooms the patch panels shall be rack mounted.

C. The Patch Panel shall consist of a Modular to 110-type connector system. Modular jacks shall meet the specifications detailed above (NON-KEYED 8-pin).

D. The largest single patch panel configuration shall not exceed 72 ports. Panels which are modular shall be fully populated (all ports occupied by jacks) and be provided in increments of no less than 12-jacks. High density patch panel configurations must incorporate station cable management systems sized to accommodate the quantity of patch panel jacks being installed. Provide sufficient quantity of Patch Panels to terminate SIO's shown plus 20% spare jacks.

E. The Patch Panel blocks shall have the ability to seat and cut 8 conductors (4 pairs) at a time and shall have the ability of terminating 22- through 26-gauge plastic insulated, solid and stranded copper conductors. Data blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.

F. The Patch Panel as a system (including jack, cable interface and intermediate components) must maintain Category 6 performance per the referenced TIA/EIA documents. All pair combinations must be considered, with the worst-case measurement being the basis for compliance.

G. Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to insure that all manufacturers minimum bend radius specifications are adhered to.

H. The Patch Panel shall have color coded designation strips to identify cable count.

I. Transmission performance shall be maintained by the Patch Panel as a system (including jack, cable interface and intermediate components).

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS - CABLE

A. General

1. Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified above.
2. It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.
3. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken. Beginning installation means contractor accepts existing conditions.
4. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.
5. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to insure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away" or other approved method.
6. The contractor will be responsible for identifying and reporting to the Site Coordinator(s) any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway or other hardware must be repaired by the Contractor. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced by the contractor to match color, size, style and texture.

7. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed.
8. All wiring shall be run "free-air", in conduit, in a secured metal raceway or in modular furniture as designated on the floorplan(s). All cable shall be free of tension at both ends.
9. Avoid abrasion and other damage to cables during installation.
10. Pulling Lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.
11. The Cable system will be tested and documented upon completion of the installation as defined in the Section below.
12. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
13. Should it be found by the Engineer, that the materials or any portion thereof, furnished and installed under this contract, fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

B. Station Cabling
1. Station Cabling on each Floor shall be routed to the Telecommunications Room (TR) on that floor or to the designated TR if on another floor.
2. Station cables shall be run to the SIO from the Telecommunications Room serving each area supported by J-hooks, in cable tray where shown on the drawings and/or in modular furniture.
3. The maximum station cable length shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the Engineer prior to installation. Changes to the plan shall be approved by the Engineer.
4. All cables shall be installed splice-free.
5. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
6. Avoid abrasion and other damage to cables during installation.
7. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.
8. Where installed in J-hooks, installation shall consider the following:
   a. Cable shall run at right angles and be kept clear of other trades work.
   b. Cables shall be supported according to code utilizing "J-hook" supports anchored to ceiling concrete, piping supports or structural steel beams. J-hooks shall be designed to maintain cables bend to larger than the minimum bend radius.
   c. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 6-inches, another

support shall be used.

d. Cable shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.

e. Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.

9. Manufacturer's minimum bend radius specifications shall be observed in all instances.

10. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

11. Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.

12. A coil of 4 feet in each cable shall be placed in the ceiling at the last support before the cables enter a fishable wall, conduit, surface raceway or box. At any location where cables are installed into movable partition walls or modular furniture via a service pole, approximately 15-feet of slack shall be left in each station cable under 250-feet in length to allow for change in the office layout without re-cabling. These "service loops" shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

13. Approximately 10-feet of slack shall be left in each station cable under 250-feet in length to allow for changes in the telecommunication room layout without re-cabling. These "service loops" shall be secured with "J" hooks above the equipment, racks, and patch panels and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

14. To reduce or eliminate EMI, the following minimum separation distances from ≤480V Power lines shall be adhered to:

    a. Twelve (12) inches from power lines of <5-kVa.

    b. Eighteen (18) inches from high voltage lighting (including fluorescent).

    c. Thirty-nine (39) inches from power lines of 5-kVa or greater.

    d. Thirty-nine (39) inches from transformers and motors.

15. All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.

16. IMPORTANT: Within the room in which Data Cabling is to be terminated, Hook and Loop (e.g. "Velcro") ties only shall be used from room entry to the point of termination. This is to facilitate the addition of future cables.

C. Standard Information Outlet

1. Information Outlets shall be flush mounted on wall-mounted boxes, in floor-mounted boxes, and on Surface Raceway.

2. Any outlets to be added where these conditions are not met shall be positioned at a height matching that of existing services or as directed otherwise by the Engineer. Nominal height (from finished floor to center line of SIO) in new installation shall be as follows:

a.	Standard Information Outlet	18-inches
b.	Wall-Mounted Telephone Outlet	46-inches

D. Cable Termination - UTP

1. Patch Panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.

2. Patch panels shall be sized to accommodate a minimum of 20% growth in the quantity of stations relative to the initial installation.

3. At SIO's and Patch Panels, the installer shall insure that the twists in each cable pair

are preserved to within 0.5-inch of the termination. The cable jacket shall be removed only to the extent required to make the termination.

E. Identification and Labeling

1. SIO's shall be labeled according to the following: [Telecom Room]-[Floor]-[Outlet number].
2. Example: TR1-2-46 represents Telecom Room number one, second floor, outlet number 46.
3. All Copper Backbone and Station Cables, Outlet Faceplates and Termination components (e.g. Patch Panel) shall be clearly labeled.
4. All labels shall be machine generated, black capital letters on a white background. Install labels under clear protective covers on SIO faceplates and patch panels.
5. Prior to installation, the Contractor shall provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used.

3.02 COOPERATION

A. The Contractor shall cooperate with other trades and owner personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the Owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

3.03 TESTING AND ACCEPTANCE

A. General

1. The contractor is responsible to perform acceptance tests as indicated below for each sub-system (e.g. backbone, station, etc.) as it is completed.
2. All tests shall be documented.
3. The Contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests.
4. The Contractor shall visually inspect all cabling and termination points to insure that they are complete and conform to the wiring pattern defined herein. The contractor shall provide the Engineer with a written certification that this inspection has been made.
5. The Contractor shall conduct acceptance testing according to a schedule coordinated with the General Contractor and Owner. Representatives of the Owner may be in attendance to witness the test procedures. The contractor shall provide a minimum of one (1) week advance notice to the Owner as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.
6. IMPORTANT: Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.
7. Tests related to connected equipment of others shall only be done with the permission and presence of Contractor involved. The Contractor shall ascertain that testing only as required to prove the wiring connections are correct.
8. The Contractor shall provide test results and describe the conduct of the tests including the date of the tests, the equipment used and the procedures followed. At the request of the Engineer, the contractor shall provide copies of the original test results.
9. All cabling shall be 100% fault free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of the contractor. The applicable tests shall then be repeated.

10. Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

B. Coordination with Section 01 91 00 Communications Commissioning Contractor

1. This project includes a separate Communications Commissioning Contractor. The scope of work for the Communications Commissioning Contractor is specified in Section 01 91 00.
2. The Section 27 10 00 contractor shall complete all work and testing indicated in this section. Submit test results to the Section 01 91 00 contractor for review. Copy the Engineer and Owner on all transmittals (including documents) to the Section 01 91 00 contractor. If the Section 01 91 00 contractor finds any work not in conformance with the specifications or has a test result that fails, the Section 27 10 00 shall correct the condition, retest and resubmit the test information to the Section 01 91 00 contractor. If the Section 01 91 00 contractor finds a repeated failure of the same item, the Section 27 10 00 contractor will reimburse the Section 01 91 00 contractor $200 per Cat. 6 cable until the item is corrected. The Engineer will resolve all disputes between the Section 27 10 00 and Section 01 91 00 contractors.
3. All work shall be done to the satisfaction of the Section 01 91 00 contractor, the Engineer and the Owner.

C. Station Cabling - Copper UTP

1. Testing shall be from the Jack at the SIO to the Patch Panel at the TR on which the cables are terminated. The cabling must pass all Cat 6 TIA requirements.
2. Station cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split or mis-positioned pairs must be identified and corrected.
3. Testing of the Cabling Systems rated at TIA Category 6 shall be performed to confirm proper functioning and performance.

D. Category 6 Performance Testing

1. In addition to the above, Performance Testing shall be performed on all cables. Testing of the Transmission Performance of station cables (Category 6) shall include the following:
   a. Length
   b. Attenuation
   c. Pair to Pair NEXT Loss (new limits)
   d. PSNEXT Loss
   e. Pair to Pair ELFEXT Loss (Equal Level Far End Cross-talk)
   f. PSEFEXT Loss
   g. Propagation Delay
   h. Delay Skew
   i. Return Loss

2. Cables shall be tested to the maximum frequency defined by the standards covering that performance category. Transmission Performance Testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify "PASS" on each cable and display the specified parameters - comparing test values with standards based "templates" integral to the unit.
3. Testing shall be per ANSI/TIA/EIA 568B.2 Permanent Link test configurations and ANSI/TIA/EIA 568B.2 Category 6.

4. The maximum length of station cable shall not exceed 90 meters which allows 10 meters for equipment and patch cables. Worst case performance at 20°C, based on a Horizontal Cable length of 90 meters and Equipment Cord length of 4 meters, shall be as follows:

5. Category 6 Test Parameters:

Category 6 Cable
Permanent Link Test

Frequency	TIA/EIA 568B.2-1 Insertion Loss Attenuation	TIA/EIA 568B.2-1 NEXT Worst Pair to Pair	TIA/EIA 568B.2-1 PSNEXT Worst Case Loss	TIA/EIA 568B.2-1 ELFEXT Worst Pair to Pair Loss	TIA/EIA 568B.2-1 PSELFEXT Loss	TIA/EIA 568B.2-1 Return Loss
Mhz	Max. dB	dB	dB	DB	dB	dB
1.00	1.9	65.0	62.0	64.2	61.2	19.1
4.00	3.5	64.1	61.8	52.1	49.1	21.0
8.00	5.0	59.4	57.0	46.1	43.1	21.0
10.00	5.5	57.8	55.5	44.2	41.2	21.0
16.00	7.0	54.6	52.2	40.1	37.1	20.0
20.00	7.9	53.1	50.7	38.2	35.2	19.5
25.00	8.9	51.5	49.1	36.2	33.2	19.0
31.25	10.0	50.0	47.5	34.3	31.3	18.5
62.50	14.4	45.1	42.7	28.3	25.3	16.0
100.00	18.6	41.8	39.3	24.2	21.2	14.0
200.00	27.4	36.9	34.3	18.2	15.2	11.0
250.00	31.1	35.3	32.7	16.2	13.2	10.0

6. Propagation Delay
   a. The maximum propagation delay determined in accordance with the ANSI/TIA/EIA –568B.2 for a Permanent Link configuration shall be less than 498-ns measured at 10MHz. (Note: In determining the permanent link propagation delay, the propagation delay contribution of connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 100MHz).
7. Delay Skew
   a. For all frequencies from 1 MHz to 250 MHz, Category 6 cable propagation delay skew shall not exceed 44ns/100m at 20 degrees C, 40 degrees C, and 60 degrees C. In addition, the propagation delay skew between all pairs shall not vary more than +/- 10ns from the measured value at 20 degrees C when measured at 40 degrees C and 60 degrees C. Compliance shall be determined using a minimum 100m of cable.
   b. In order to establish testing baselines, cable samples of known length and of the cable type and lot installed shall be tested. The cable may be terminated with an 8-position Category 6 Modular plug (8-pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be calculated based on this test and be utilized during the testing of the installed cable plant. This requirement can be waived if NPV data is available from the cable manufacturer for the exact cable type under test.
   c. In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacement and changes as are necessary, and shall then repeat the test or tests which disclosed faulty or defective material, equipment or installation method, and shall make additional tests as the Engineer deems necessary at no additional expense to the project or Owner.

3.04 DOCUMENTATION

A. General

1. Upon completion of the installation, the contractor shall provide three (3) full Documentation Sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation of Test Results shall be submitted in hard copy and in electronic form (pdf format). Electronic documents shall be submitted on CD-ROM.
3. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and *draft* as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.
4. At the request of the Engineer, the contractor shall provide copies of the original test results.
5. All documentation, including hard copy and electronic forms shall become the property of the owner.
6. The Engineer may request that a 10% random field re-test be conducted on the cable system - at no additional cost - to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the Contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

B. Test Data - Copper Media
1. Test results shall include a record of test frequencies, cable type, conductor pair and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).

END OF SECTION

SECTION 27 10 01

COMMISSIONING PROCESS FOR CABLE AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. This section includes the commissioning requirements for communications systems.

1.02 COMMISSIONING INTENT

A. The intent of this section is to ensure that all installed work described in Section 27 10 00 meets the specified requirements. This will be determined by the review of the installing contractor's test results and by testing performed by this section contractor of all communication systems.

1.03 DEFINITIONS

A. Communications: All the work in Section 27 10 00.

B. Commissioning: The process of ensuring that systems are installed, functionally tested and capable of being used in conformity with the design intent.

C. Commissioning Contractor: This section contractor.

1.04 QUALITY ASSURANCE

A. The commissioning contractor shall be a company specializing in communications testing with a minimum of five years documented experience and completed four jobs of the magnitude specified in Section 27 10 00.

B. The commissioning contractor shall have a BICSI certified technician review the test results and perform the testing required by this section. This technician shall have a minimum of five years experience in similar communications work.

C. The commissioning contractor shall be a subcontractor directly to the General Contractor.

D. The commissioning contractor shall not be related in any way to the Section 27 10 00 contractor.

E. This section contractor shall study and be thoroughly familiar with Section 27 10 00.

1.05 RELATED WORK AND REQUIREMENTS

A. Section 01 33 00: Submittals

B. Section 27 10 00: Communications Cable and Equipment

1.06 REGULATORY REFERENCES

A. The commissioning contractor will review the installed communications systems with regard to the following regulatory references:

B. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.

C. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

D. Other applicable standards are as follows:

1. ANSI/IEEE C2 - National Electrical Safety Code

2. NFPA 70- 2005 - National Electrical Code
3. Comm. Chapter 16 - Wisconsin Electrical Code
4. TIA/EIA Standards 526-14A (OFSPT-14A), 526-7 (OFSPT-7), 568B.2 (Category 6), 568B.3, 569A, 606A, and 607 (with exception)
5. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
6. ICEA publication S-80-576-2002

1.07 COORDINATION

A. During the project and warranty period, coordinate commissioning of the communications system with the General Contractor, Section 27 10 00 Contractor, Engineer, the respective user group(s), and the City of Madison Information Services department.

B. All correspondence between the commissioning contractor and the Section 27 10 00 contractor shall be copied to the General Contractor, Owner and Engineer.

1.08 SUBMITTALS

A. Include the following items along with bid. Not including these documents with bid will be grounds for rejection of bid.
   1. Name and documentation of the contractor's BICSI certified technician who will be performing the work in this specification.
   2. Signed letter with brief description of companies services and number of years in business performing said services.
   3. Listing of at least four projects of similar magnitude to this project.
   4. Signed letter stating that the company is independent from the General Contractor and the Section 27 10 00 contractor.

1.09 WARRANTY

A. The Section 27 10 00 contractor is required to warrant the Cat. 6 system for fifteen (15) years. The Section 01 91 00 contractor will participate in any warranty claims for the same time period as stated below.
   1. In the event of a warranty claim, the Owner will contact the Section 01 91 00 contractor first to review the item of concern. If corrective action is required, the Section 27 10 00 contractor will receive direction from the Section 01 91 00 contractor, and then perform the necessary work to correct the situation. The Section 27 10 00 contractor will then test the work to show conformance with this specification section. Test results will be submitted to the Section 01 91 00 contractor for review. All aspects of PART THREE – EXECUTION in this section will be followed until the Owner accepts the corrected work.

1.10 REVIEW OF TEST RESULTS WITH OWNER'S PERSONNEL

A. Include one hour meeting with Owner to review test results. Meeting to be held during normal working hours. Schedule review meeting with the Owner two weeks in advance.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 REVIEW OF SECTION 27 10 00 CONTRACTOR TEST RESULTS

A. The Section 27 10 00 contractor will submit their test results to the Section 01 91 00 contractor for review. The commissioning contractor shall review the submittal and ensure that all documents are in compliance with Section 27 10 00. If the documents are not complete or do not meet Section 27 10 00 requirements, return the documents to the Section 27 10 00 contractor for correction and resubmittal clearly noting the deficiencies.

3.02 COMMUNICATIONS COMMISSIONING

A. After the Section 27 10 00 contractor test results are acceptable, the Section 01 91 00 contractor will perform their own independent tests. These tests shall follow Section 27 10 00, Part 3, Execution requirements.

B. If the Section 01 91 00 contractor finds any work not in conformance with the specifications, instruct the Section 27 10 00 contractor to correct the condition, retest and resubmit the test information to the Section 01 91 00 contractor. The Section 01 91 00 contractor will then retest the item. If the Section 01 91 00 contractor finds a repeated failure of the same item, the Section 27 10 00 contractor will reimburse the Section 01 91 00 contractor $200 per Cat. 6 test until the item is corrected.

3.03 SUBMITTING TEST RESULTS

A. Upon completion of all testing with positive results, assemble test results in both hard copy and pdf format on CD. Submit 3 sets of test results for Engineer review. Refer to Section 27 10 00 for test submittal requirements.

B. All documentation, including hard copy and electronic forms shall become the property of the City of Madison.

3.04 CERTIFICATION LETTER

A. The commissioning contractor shall submit to the Engineer a letter certifying that all Section 27 10 00 work is complete and performs as specified.

SECTION 28 31 00
FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This specification provides the requirements for the addition of components to a complete fire alarm system. The system shall include, but is not limited to: alarm initiating and indicating peripheral devices, conduit, HVAC system interlocking relays, wire and accessories required to furnish a complete operational system.

B. Related Documents

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. Section 26 01 00 - General Electrical Provisions
3. Section 26 05 33 - Raceway and Boxes.
4. Section 26 05 53 - Electrical Identification

C. Applicable Codes and Standards

1. The equipment and installation shall comply with the current provisions of the following codes and standards:
   a. LOCAL CODES, STANDARDS AND REQUIREMENTS.
   b. NFPA 70 - National Electric Code® Article 760
   c. NFPA 72 - 1999 National Fire Alarm Code®
   d. NFPA 90A - 1999 Air Conditioning Systems
   e. NFPA 101- 2000 Life Safety Code®
   f. UL 864 - Control Units for Fire Protective Signaling Systems.
   g. UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
   h. UL 268A - Smoke Detectors for Duct Applications.
   i. UL 217 - Single and Multiple Station Smoke Alarms.
   j. UL 521 - Heat Detectors for Fire Protective Signaling Systems.
   k. UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
   l. UL 464 - Audible Signaling Appliances.
   m. UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems.
   n. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
   o. UL 1971 - Signaling Devices for the Hearing-Impaired.
   p. UL 1481 - Power Supplies for Fire Protective Signaling Systems.
   q. UL 1711 - Amplifiers for Fire Protective Signaling Systems.
   r. UL 1635 - Digital Alarm Communicator System Units.
   s. Local and State Building Codes
   t. Americans with Disabilities Act (ADA)
   u. International Standards Organization (ISO)
      i. ISO-9000
      ii. ISO-9001

1.02 DEFINITIONS

A. FACP: Fire Alarm Control Panel.

1.03 SYSTEM DESCRIPTION

A. General

1. The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional fire alarm system (System). The System shall comply in respects with all pertinent codes, rules, regulations and laws of the Authority, and local jurisdiction. The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings.
2. It is further intended that upon completion of this work, the Owner be provided with:
    a. Complete information and drawings describing and depicting the entire system(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system(s) at a future date.
    b. Complete documentation of system(s) testing.
    c. Certification that the entire system(s) has/have been inspected and tested, is/are installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and ULI listings, and is/are in proper working order. Contractor shall use "Fire Alarm System Certification and Description" as required by Section 1-6.2 of NFPA 72 - 1999 edition.

B. Description

1. Modify an existing fire detection and alarm system consisting of:
    a. LCD annunciator shall be located as shown on the drawings.
    b. Manual pull stations shall be located as shown on the drawings.
    c. Area smoke detection shall be provided as shown on drawings.
    d. Area heat detection shall be provided as shown on drawings.
    e. Duct smoke detection shall be provided as shown on the drawings.
    f. Monitor the sprinkler system waterflow(s) and valve supervisory switch(s).
    g. Provide magnetic door holder and smoke detection at fire doors as shown on the drawings.
    h. Provide audible appliances located throughout the building, as shown on the drawings.
    i. Provide synchronized visual appliances located throughout the building, as shown on the drawings.
    j. Provide fan shutdown controls for system where duct smoke detectors are specified.
    k. Provide direct interface to the building automation system, as required.
    l. Provide connection and functions for remote monitoring services.

C. Sequence of Operations

1. General
    a. Upon the alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:
        i. The internal audible device shall sound at the control panel or command center.
        ii. The LCD display shall indicate all applicable information associated with the alarm condition including; zone, device type, device location and time/date.
        iii. Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.
        iv. Activate notification audible appliances.

v. Activate visual strobes notification appliances. 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.

vi. Transmit signal to the building automation system, as required.

vii. Transmit signal to the central station.

viii. Activate automatic smoke control sequences.

ix. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

2. Duct Smoke Activation – Supervisory

a. The supervisory activation of any duct smoke detector, the following functions shall automatically occur:

i. The internal audible device shall sound at the control panel or command center.

ii. Display the event on the control panel/annunciator.

iii. The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.

iv. Any remote or local annunciator LED's associated with the alarm zone shall be illuminated.

v. Transmit signals to remote annunciators.

vi. Transmit signal to the building automation system, as required.

vii. Shutdown the local air handling unit.

viii. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

3. Supervisory Operation

a. Upon supervisory activation of any sprinkler valve supervisory switch, fire pump off-normal, clean agent fire suppression system trouble, the following functions shall automatically occur:

i. The internal audible device shall sound at the control panel or command center.

ii. The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.

iii. All system activity/events shall be documented on the system printer.

iv. Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.

v. Transmit signal to the central station with point identification.

4. Trouble Operation

a. Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur:

i. The internal audible device shall sound at the control panel or command center.

ii. The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device location and time/date.

iii. All system activity/events shall be documented on the system printer.

iv. Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.

5. Monitor Activation

a. Upon activation of any device connected to a monitor circuit, the following

functions shall automatically occur:

i. The internal audible device shall sound at the control panel or command center.

ii. The LCD display shall indicate all applicable information associated with the status condition including; zone, device type, device location and time/date.

iii. All system activity/events shall be documented on the system printer.

iv. Any remote or local annunciator LCD/LED's associated with the status zone shall be illuminated.

D. System Configuration

1. General

a. All Life Safety System equipment shall be arranged and programmed to provide the early detection of fire, the notification of building occupants, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants.

2. Power Supply

a. Standby power supply shall be an electrical battery with capacity to operate the system under maximum supervisory load for 24 hours and capable of operating the system for 10 minutes in the alarm mode at 100% load. The system shall include a charging circuit to automatically maintain the electrical charge of the battery. The system shall automatically adjust the charging of the battery to compensate for temperature.

3. Display

a. The main display interface shall show the first and most recent highest priority system events without any operator intervention. All system events shall be directed to one of four message queues. Messages of different types shall never intermixed to eliminate operator confusion. A "Details" switch shall provide additional information about any device highlighted by the operator.

4. Initiating Device Circuits

a. Initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be Class B Style "B". Initiating device circuits monitoring magnetic security contacts, motion detectors, duress station, glass break and intrusion type devices shall be Class B Style "B".

5. Notification Appliance Circuits

a. All notification appliance circuits shall be Class B Style "Y". All notification appliance circuits shall have a minimum circuit output rating of: 2 amps @ 24 vdc; 50 watts @ 25V audio, and 35 watts @ 70V audio. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

6. Signaling Line Circuits

a. When a signaling line circuit covers more than one fire/smoke compartment, a wire-to-wire short shall not effect the operation of the circuit from the other fire/smoke compartments. The signaling line circuit connecting network panel/nodes, annunciators, command centers, shall be Class B style 4. The media shall be copper except where fiber optic cable is specified on the drawings.

b. The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be Class B style 4.

7. Network Wiring

a. The system supplied under this specification shall utilize node to node, direct

wired multi-priority peer-to-peer network operations. The system shall utilize independently addressed, smoke detectors, heat detectors and input/output modules as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between nodes.

b. When a network is wired in a Class B configuration, a single break or short on the network wiring isolates the system into two groups of panels. Each group continues to function as a peer-to-peer network working with their combined databases. When wired using a Class A configuration, a single break or short on the network wiring causes the system to isolate the fault, and network communication continues uninterrupted, without any loss of function. Should multiple wiring faults occur, the network re-configures into many sub-networks and continues to respond to alarm events from every panel that can transmit and receive network messages.

8. Network Nodes
   a. The remote control panel(s) (network nodes) shall meet the same requirements as described in control panel section and shall contain the following:
      i. Common control switches with 168 character LCD display, as required.
      ii. Integral power supply(s) with secondary stand-by power.
      iii. Signaling line circuits for communications with analog/addressable devices, as required.
      iv. Notification appliance circuits, as required.
      v. Auxiliary function circuits and operations, as required.
9. DACT
   a. The system shall provide off premise communications capability (DACT) for transmitting system events to multiple Central Monitoring Station (CMS) receivers. The system shall provide the CMS(s) with point identification of system events using Contact ID or SIA DCS protocols. The system shall provide an individual CMS account for each tenant, and send the required signals to the one or more CMS(s) and account(s) specified by each tenant. In the event of a panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the CMS.

1.04 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures in addition to the following requirements.

B. Product Data for each type of system component specified including dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and Nationally Recognized Testing Laboratory (NRTL)-listing data.

C. Shop Drawings
   1. A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:
      a. Control panel wiring and interconnection schematics.
      b. Complete point to point wiring diagrams.
      c. Wiring diagrams from manufacturer shall differentiate clearly between factory- and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Make all diagrams specific to this Project and distinguish between field and factory wiring.

d. Riser diagrams.

e. Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.

f. Complete system bill of material.

g. System Calculations

i. Complete calculations shall be provided which show the electrical load on the following system components:

ii. Each system power supply, including stand alone booster supplies.

iii. Each standby power supply (batteries).

iv. Each notification appliance circuit.

v. Each auxiliary control circuit that draws power from any system power supply.

2. Operating instructions for mounting at the FACP.

3. All required documentation for City of Madison Fire Department review.

D. Project specific operating manuals covering the installed integrated life safety system. The manual shall contain a detailed narrative description of the system architecture, inputs, notification signaling, auxiliary functions, annunciation, sequence of operations, expansion capability, application considerations and limitations. Manufacturer's data sheets and installation manuals/instructions for all equipment supplied. A generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.

E. Maintenance data for fire alarm systems to include in the operation and maintenance manual specified in Division 1. Include data for each type of product, including all features and operating sequences, both automatic and manual. Include recommendations for spare parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

F. Record of field tests of system.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced factory-authorized Installer to perform work of this Section.

B. Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility of system components.

C. Compliance with Local Requirements: Comply with the applicable building code, local ordinances, and regulations, and the requirements of the authorities having jurisdiction.

D. Comply with NFPA 70 and NFPA 72.

E. Listing and Labeling: Provide systems and equipment specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

F. Warranty

1. The contractor shall warranty all materials, installation and workmanship for one (1) year from date of acceptance, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.

2. The System Supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the owner notifying the contractor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. All System components shall be the cataloged products of a single supplier. All products shall be listed by the manufacturer for their intended purpose.

B. All control panel assemblies and connected field appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as to ensure that a fully functioning is designed and installed. The system supplied under this specification shall be a microprocessor-based direct wired, multi-priority peer-to-peer networked system. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, and modules as described in this specification.

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

1. Simplex/Grinnell
2. EST
3. Notifier
4. Approved equal prior to bid

2.02 FIELD MOUNTED SYSTEM COMPONENTS

A. Fire Initiating Devices

1. Smoke Detectors & Accessories

a. Duct Detector Housing

i. Provide smoke detector duct housing assemblies to mount an analog/addressable detector along with a standard, relay or isolator detector mounting base. The housing shall also protect the measuring chamber from damage and insects. The housing shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Drilling templates and gaskets to facilitate locating and mounting the housing shall also be provided. The housing shall be finished in baked red enamel. Remote alarm LED indicators and remote test stations shall be provided.

b. Smoke Detector – Photoelectric

i. Provide analog/addressable photoelectric smoke detectors at the locations shown on the drawings. The detector shall have the ability to set the sensitivity and alarm verification of each of the individual detectors on the circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

ii. Provide combination smoke/heat detectors where required on drawings.

2. Heat Detectors

a. Fixed Temperature-ROR Heat Detector

i. Provide analog/addressable combination fixed temperature / rate-of-rise detectors at the locations shown on the drawings. The heat detector shall have a nominal fixed temperature alarm point rating of 135°F

(57°C) and a rate of rise alarm point of 15°F (9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

3. Detector Bases
   a. Detector Base – Standard
      i. Provide standard detector mounting bases suitable for mounting on either North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box. The base shall, contain no electronics and support all series detector types.
4. Manual Stations
   a. Manual Station - Double Action Single Stage
      i. Provide analog/addressable double action, single stage fire alarm stations at the locations shown on the drawings. The fire alarm station shall be of polycarbonate construction and incorporate an internal toggle switch. A locked test feature shall be provided. The station shall be finished in red with silver "PULL IN CASE OF FIRE" lettering. The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers.
   b. Notification Appliances
      i. Horn-Strobes
      ii. Low Profile Horn-Strobes
      iii. Provide low profile wall mount horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 94 dBA at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd & 110cd devices. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Low profile horn/strobes shall mount in a North American 1-gang box.
5. Strobes
   a. Low Profile Strobes
      i. Provide low profile wall mounted strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, or 110cd devices. Low profile strobes shall mount in a North American 1-gang box.
6. Initiation & Control Modules
   a. Relay Module
      i. Provide addressable control relay circuit modules at the locations shown on the drawings. The module shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware.
   b. Notification Appliance Circuits
      i. Provide addressable notification appliance circuit modules at the locations shown on the drawings. The module shall provide one (1) supervised Class B notification circuit. The module shall provide polarized audible / visual selection for 24Vdc @ 2amps, audio outputs at 25Vrms @ 50 watts or 70 Vrms @ 35 watts.

c. Isolation Module

i. Provide addressable fault isolator circuit modules at the locations shown on the drawings. The module shall be capable of isolating and removing a fault from a Class A data circuit while allowing the remaining data loop to continue operating.

2.03 WIRE

A. Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

B. All initiating circuit, signaling line circuit, AC power conductors, shield drain conductors and grounding conductors, shall be solid copper, stranded or bunch tinned (bonded) stranded copper.

C. All signaling line circuits, including all addressable initiating device circuits shall be 18 AWG minimum multi-conductor jacketed twisted cable or twisted shielded or as per manufacturer's requirements.

D. All non-addressable initiating device circuits, 24 VDC auxiliary function circuits shall be 18 AWG minimum or per manufacturer's requirements.

E. All notification appliance circuit conductors shall be solid copper or bunch tinned (bonded) stranded copper. Where stranded conductors are utilized, a maximum of 7 strands shall be permitted for No. 16 and No. 18 conductors, and a maximum of 19 strands shall be permitted for No. 14 and larger conductors.

F. All audible notification appliance circuits shall be 14 AWG minimum twisted pairs or twisted pairs shielded or per manufacturer's requirements.

G. All visual notification appliance circuits shall be 14 AWG minimum THHN or twisted pairs or twisted shielded pairs or per manufacturer's requirements.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Install system according to NFPA standards referenced in Parts 1 and 2 of this Section.

B. Fire Alarm Power Supply Disconnect: Paint red and label "FIRE ALARM." Provide with lockable handle or cover.

3.02 EQUIPMENT INSTALLATION

A. Smoke Detectors: Install ceiling-mounted detectors not less than 4 inches (100 mm) from a side wall to the near edge. Install detectors located on the wall at least 4 inches (100 mm), but not more than 12 inches (300 mm), below the ceiling. For exposed solid-joist construction, mount detectors on the bottom of the joists. On smooth ceilings, install detectors not over 30 feet (9 m) apart in any direction. Install detectors no closer than 60 inches (1520 mm) from air registers.

B. Audible Alarm-Indicating Devices: Install not less than 90 inches (2280 mm) above the finished floor nor less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille or as indicated. Combine audible and visual alarms at the same location into a single unit.

C. Visual Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and not more than 80 inches (2030 mm) above the finished floor and at least 6 inches (150 mm) below the ceiling.

D. Manual pull-stations: Install pull stations at 44" above finished floor to the bottom of the box.

E. Provide additional power supply as required to supplement the existing power supply to meet the demand of the additional notification devices.

3.03 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Section 26 05 33 Raceway and Boxes". Conceal raceway except in unfinished spaces and as indicated.

B. Wiring within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and a different color code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visual alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

3.04 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals to match the existing system identification.

B. Fire alarm system junction box covers shall be painted red.

3.05 GROUNDING

A. Provide grounding as required by FACP/power supply manufacturer.

3.06 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Pre-testing: After installation, align, adjust, and balance the system and perform complete pre-testing. Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pre-testing: After pre-testing is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.

D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits using an insulation-testing device.
3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of the initiating and indicating devices. Observe proper signal transmission according to

class of wiring used.

6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.
8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

F. Re-testing: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.

H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.07 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.08 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to provide startup service and to demonstrate and train Owner's maintenance personnel as specified below.
1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of 2 hours' training.
2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
3. Schedule training with Owner with at least 7 days' advance notice.

3.09 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to 3 requested adjustment visits to the site for this purpose.

END OF SECTION

SECTION 33 44 16
PREFABRICATED UTILITY TRENCH DRAIN SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Provide prefabricated trench drain system, complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

1.02 QUALITY ASSURANCE

A. Standards:

1. Comply with standards specified in this Section.

B. Qualifications of Manufacturer:

1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.

C. Qualifications of Installers:

1. Use 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.

1.03 SUBMITTALS

A. General:

1. Comply with provisions of Section 01 33 00.

B. Manufacturer's Data:

1. Within 15 calendar days after award of Contract, submit:
2. Complete materials list of all items proposed to be furnished and installed under this Section;
3. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
4. Shop Drawings showing components, arrangements, dimensions, orientation on ground, sections of members, dimension elevations, grounds, reinforcements, and accessories.

1.04 PRODUCT HANDLING

A. Protection:

1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.

B. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 PREFABRICATED TRENCH DRAINS

A. Design of Trench drains is based on Perma-Trench model Z-882, as manufactured by Zurn Industries, Inc.. The drain shall incorporate a grate and frame able to withstand a uniform load of 50 PSF and a concentrated load of 2000 lbs. on a 20 square inch area. The grate shall also be heel proof. Design of the grate is based on model number Z-882-RPG, as manufactured by Zurn. Equivalent products of other manufacturers may be considered

subject to the provisions of Section 01 33 00.

B. Grate system shall show compliance with ADAAG Section 4.5.4.

C. Equip trench drain with channel braces and channel chairs to prevent any movement of the frame during installation of concrete.

D. Furnish to the Owner upon substantial completion of the Project two shovel heads shaped to match the inside diameter of a channels as manufactured by drain supplier. The shovel heads shall be secured to 5'-0" long wood handles furnished by the Contractor.

2.02 OTHER MATERIALS

A. All other materials, not specifically described, but required for a complete and proper installation of the work of this Section, shall be new, first-quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install in locations shown on the Drawings, as specified herein, and at elevations per Drawings and in accordance with the manufacturer's instructions. Furnish and install all grounds, brackets, anchors, trim and accessories for a complete installation.

3.03 FINAL INSPECTION

A. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

END OF SECTION

SECTION E: PROPOSAL

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

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 - 2012 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.
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. Accompanying this Proposal is ☐ Bid Bond or ☐ Certified Check in the amount of _____ Dollars ($_____)or ☐ a Certificate of Biennial Bid Bond as required by the Advertisement for Bids.
   (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.

State of Wisconsin
Department of Workforce Development
Equal Rights Division
Labor Standards Bureau

Disclosure of Ownership

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.

(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.

(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.

(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**.
- (A) The contractor, or a shareholder, officer or partner of the contractor:
  - (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.
  - (2) Or has owned at least a 25% interest in the "other construction business" at any time within the preceding three (3) years.
- (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.

Other Construction Business

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

I hereby state under penalty of perjury that the information, contained in this document, is true and accurate according to my knowledge and belief.

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)

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

Best Value Contracting

1. The Contractor shall indicate the non-apprenticeable trades used on this contract.

_____

_____

_____

_____

_____

_____

_____

2. Some Contractors are exempt due to the size of the work force. Apprenticeable trades are those trades considered apprenticeable by the State of Wisconsin.

☐ Check Here if the Contractor has a total skilled work force of four or less individuals in all apprenticeable trades combined. This contractor is exempt from Best Value Contracting.

3. The Contractor shall indicate on page E-4 which apprenticeable trades are to be used on this Contract and shall indicate by checking the appropriate box for the trades used, how the contractor will comply with Madison General Ordinance 33.07(7).

Legend

Number of Journeyworkers	The Contractor shall indicated for trades to be used on this Contract only, the number of journeyworkers that the Contractor has employed company wide.
W-ATT	The Contractor is an active trade trainer in the State of Wisconsin for the trade indicated.
US-ATT	The Contractor is an active trade trainer in an apprenticeship program approved by the U.S. Department of Labor or another state apprenticeship agency in the trade indicated.
SB-ATT	The Contractor shall become an active trade trainer prior to beginning work on the Contract in the trade indicated.

☐ The Contractor has reviewed the list on page E-4 and shall not use any apprenticeable trades on this project.

☐ The Contractor has reviewed this list on E-4 and has checked the appropriate box by each apprenticeable trade to be used on the project.

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

Apprenticeable Trades

Check the box in the column "Trade Used on This Project" for each apprenticeable trades used on this project. For those trades used on the project indicated the number of journeyworkers that are employed company wide and check a box to the right of the trade as to how the Contractor will comply MGO 33.07(7). Refer to the legend on page E-3 for the meaning associated with each heading. The Contractor must check one of the boxes on the right for each apprenticeable trade used and checked on the left.

Trade Used on Contract	Apprenticeable Trades	Number of Journeyworkers	W-ATT	US-ATT	SB-ATT
☐	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 & Waterproofer		☐	☐	☐
☐	Sheet Metal Worker		☐	☐	☐
☐	Sprinklerfitter		☐	☐	☐
☐	Steamfitter		☐	☐	☐
☐	Steamfitter (Refrigeration)		☐	☐	☐
☐	Steamfitter (Service)		☐	☐	☐
☐	Taper & Finisher		☐	☐	☐
☐	Telecommunications (Voice, Data & Video) Installer-Technician		☐	☐	☐
☐	Tile Setter		☐	☐	☐

NAME OF BIDDER

Project Name MADISON POLICE DEPARTMENT TRAINING CENTER - PHASE 3

Contract No. 6457

ITEM	TYPE OF WORK	ESTIMATED QUANTITES		TOTAL BID
ACCOUNT NO. CB71-58401-810642-00-53W1009				
BB	BASE BID	1.0	LUMP SUM	
A1	Alternate A1: Vinyl Wall Fabric. Add price to furnish and install vinyl wall fabric per specifications and details. The only room with vinyl fabric is the Auditorium 115.	1.0	LUMP SUM	
		SUB TOTAL (BB + A1)		$ -
A2	Alternate A2: New suspended ceiling. Furnish and install new suspended ceiling per specifications and details. Rooms involved Womens Restroom 107, Womens Lockers 108 , Mens Restroom 109, Mens Lockers 110.	1.0	LUMP SUM	
		SUB TOTAL (BB+A1+A2)		$ -
A3	Alternate A3: Owner supplied marble. Add price to clean, cut, polish, and install per specifications and details owner supplied marble for accent pieces, Rooms involved include Lobby 113 (Kiosk), Auditorium 115, Break Area 118, at drinking fountains near Restrooms 120 & 121	1.0	LUMP SUM	
		SUB TOTAL (BB+A1+A2+A3)		$ -

NOTES:

1. The bidder must completely fill in the LUMP SUM BASE BID and the LUMP SUM for each of the three (3) ALTERNATE BID items in ink.
2. The bidder must completely fill in the SUB TOTALS after each ALTERNATE using the formulas provided. Sub totals must be in ink.
3. After bids are received and prior to bid opening the City will establish a Construction Budget Dollar Value. The City will award the contract based on the sub totals of the base bid plus alternates in the order presented above until the sub total exceeds the predetermined Construction Budget Dollar Value.
4. The City shall have the right to proceed or not proceed with any alternate regardless of how the bid was awarded.
5. The City shall have the right to reject all bids regardless of the value of the bids submitted.

SECTION F: 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:

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

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 may 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 City of Madison, Wisconsin

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 G: AGREEMENT

THIS AGREEMENT made this _____ day of _____ in the year Two Thousand and Twelve 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:

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

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.

"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 preapprentices, 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 Subjourneypersons. Apprentices and subjourneypersons 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 therefor; 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 therefor; 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.

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, 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 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 or national original 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 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 Director of Affirmative Action.

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.

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

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 President Date

_____ _____
Witness Date Secretary Date

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 Date

_____ _____
Witness City Clerk Date

SECTION H: 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:

MADISON POLICE DEPARTMENT TRAINING CENTER-PHASE 3
CONTRACT NO. 6457

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

_____ By _____
City Attorney 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

MINIMUM WAGE SCALE

FOR

PUBLIC WORKS IMPROVEMENTS

APPROVED BY: BOARD OF PUBLIC WORKS

MADISON, WISCONSIN

February 7, 2012

The attached "Prevailing Wage Rate Determination: (Pages 1 through 30), issued February 7, 2012, is hereby approved as the Minimum Wage Scale of the City of Madison.

State of Wisconsin Department of Workforce Development Equal Rights Division	**DEPARTMENTAL ORDER**

ISSUE DATE: 1/13/2012

PROJECT:

ALL PUBLIC WORKS PROJECTS UNDER SEC 66.0903, STATS.-CITY OF MADISON
MADISON CITY, DANE COUNTY, WI
Determination No. 201200105

PROJECT OWNER:	REQUESTER:
ROBERT F. PHILLIPS, CITY ENGINEER CITY OF MADISON-ENGINEERING 210 MARTIN L KING JR BLVD, RM 115 MADISON, WI 53703	ROBERT F. PHILLIPS, CITY ENGINEER CITY OF MADISON-ENGINEERING 210 MARTIN L KING JR BLVD, RM 115 MADISON, WI 53703
ADDITIONAL CONTACT:	
NORMAN DAVIS, CONTRACT COMPLIANCE CITY OF MADISON-DEPT OF CIVIL RTS-AA DIV 210 MARTIN L KING JR BLVD, RM 523 MADISON, WI 537033342	

The department received an application for prevailing wage rate determination for the above-captioned project. The department conducted a survey to determine the prevailing wage rate for the trade(s) or occupation(s) needed to complete the project. The survey's findings appear in the attached project determination.

If you believe that the wage rate for any trade or occupation does not accurately reflect the prevailing wage rate in the city, village or town where the project is located, you may ask the department to conduct an administrative review of such wage rate. You must submit this request in writing within 30 days from the date indicated above. Additionally, your request must include wage rate information from at least three similar projects in the city, village or town where the proposed project is located and on which some work has been performed by the contested trade(s) during the current survey period and was previously considered by the department in issuing the attached determination. See DWD 290.10 of the Wisconsin Administrative Code and either s. 66.0903(3)(br), s. 66.0904(4)(e), or s. 103.49(3)(c), Stats., for a complete explanation of the administrative review process.

Enclosures

It is hereby ordered that the prevailing wage rates set forth in the attached project determination shall only be applicable to the above referenced project. This order is a **FINAL ORDER** of the department unless a timely request for an administrative review is filed with the department.

ISSUED BY:

Equal Rights Division
Labor Standards Bureau
Construction Wage Standards Section
PO Box 8928 Madison, WI 53708-8928
(608)266-6861

Web Site: http://dwd.wisconsin.gov/er/

PREVAILING WAGE RATE DETERMINATION
Issued by the State of Wisconsin
Department of Workforce Development
Pursuant to s. 66.0903, Wis. Stats.
Issued On: 1/13/2012

DETERMINATION NUMBER:	201200105
EXPIRATION DATE:	Prime Contracts MUST Be Awarded or Negotiated On Or Before 12/31/2012. 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:	Time and one-half must be paid for all hours worked: - 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. 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. A DOT Premium (discussed below) may supersede this time and one-half requirement.
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, whevenever such pay is applicable.
DOT PREMIUM:	This premium only applies to highway and bridge projects owned by the Wisconsin Department of Transportation and to the project type heading "Airport Pavement or State Highway Construction." DO NOT apply the premium calculation under any other project type on this determination.
APPRENTICES:	Pay apprentices a percentage of the applicable journeyperson's hourly basic rate of pay and hourly fringe benefit contributions specified in this determination. Obtain the appropriate percentage from each apprentice's contract or indenture.
SUBJOURNEY:	Subjourney wage rates may be available for some of the trades or occupations indicated below with the exception of laborers, truck drivers and heavy equipment operators. Any employer interested in using a subjourney classification on this project MUST complete Form ERD-10880 and request the applicable wage rate from the Department of Workforce Development PRIOR to using the subjourney worker on this project.

This document **MUST BE POSTED** by the **CONTRACTING AGENCY** in at least one conspicuous and easily accessible place **on the site of the project** . A local governmental unit may post this document at the place normally used to post public notices if there is no common site on the project. This document **MUST** remain posted during the entire time any worker is employed on the project and **MUST** be physically incorporated into the specifications and all contracts and subcontracts. If you have any questions, please write to the Equal Rights Division, Labor Standards Bureau, P.O. Box 8928, Madison, Wisconsin 53708 or call (608) 266-6861.

The following statutory provisions apply to local governmental unit projects of public works and are set forth below pursuant to the requirements of s. 66.0903(8), Stats.

s. 66.0903 (1) (f) & s. 103.49 (1) (c) "PREVAILING HOURS OF LABOR" for any trade or occupation in any area means 10 hours per day and 40 hours per week and may not include any hours worked on a Saturday or Sunday or on any of the following holidays:

1. January 1.
2. The last Monday in May.
3. July 4.
4. The first Monday in September.
5. The 4th Thursday in November.
6. December 25.
7. The day before if January 1, July 4 or December 25 falls on a Saturday.
8. The day following if January 1, July 4 or December 25 falls on a Sunday.

s. 66.0903 (10) RECORDS; INSPECTION; ENFORCEMENT.
(a) Each contractor, subcontractor, or contractor's or subcontractor's agent performing work on a project of public works that is subject to this section shall keep full and accurate records clearly indicating the name and trade or occupation of every person performing the work described in sub. (4) and an accurate record of the number of hours worked by each of those persons and the actual wages paid for the hours worked.

s. 66.0903 (11) LIABILITY AND PENALTIES.
(a) 1. Any contractor, subcontractor, or contractor's or subcontractor's agent who fails to pay the prevailing wage rate determined by the department under sub. (3) or who pays less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor is liable to any affected employee in the amount of his or her unpaid wages or his or her unpaid overtime compensation and in an additional amount as liquidated damages as provided under subd. 2., 3., whichever is applicable.
2. If the department determines upon inspection under sub. (10) (b) or (c) that a contractor, subcontractor, or contractor's or subcontractor's agent has failed to pay the prevailing wage rate determined by the department under sub. (3) or has paid less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor, the department shall order the contractor to pay to any affected employee the amount of his or her unpaid wages or his or her unpaid overtime compensation and an additional amount equal to 100 percent of the amount of those unpaid wages or that unpaid overtime compensation as liquidated damages within a period specified by the department in the order.
3. In addition to or in lieu of recovering the liability specified in subd. 1. as provided in subd. 2., any employee for and in behalf of that employee and other employees similarly situated may commence an action to recover that liability in any court of competent jurisdiction. If the court finds that a contractor, subcontractor, or contractor's or subcontractor's agent has failed to pay the prevailing wage rate determined by the department under sub. (3) or has paid less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor, the court shall order the contractor, subcontractor, or agent to pay to any affected employee the amount of his or her unpaid wages or his or her unpaid overtime compensation and an additional amount equal to 100 percent of the amount of those unpaid wages or that unpaid overtime compensation as liquidated damages.
5. No employee may be a party plaintiff to an action under subd. 3. unless the employee consents in writing to become a party and the consent is filed in the court in which the action is brought. Notwithstanding s. 814.04 (1), the court shall, in addition to any judgment awarded to the plaintiff, allow reasonable attorney fees and costs to be paid by the defendant.

BUILDING OR HEAVY CONSTRUCTION

Includes sheltered enclosures with walk-in access for the purpose of housing persons, employees, machinery, equipment or supplies and non-sheltered work such as canals, dams, dikes, reservoirs, storage tanks, etc. A sheltered enclosure need not be "habitable" in order to be considered a building. The installation of machinery and/or equipment, both above and below grade level, does not change a project's character as a building. On-site grading, utility work and landscaping are included within this definition. Residential buildings of four (4) stories or less, agricultural buildings, parking lots and driveways are NOT included within this definition.

SKILLED TRADES

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
101	Acoustic Ceiling Tile Installer	29.06	15.16	44.22
102	Boilermaker	31.09	23.75	54.84
103	Bricklayer, Blocklayer or Stonemason Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80 on 6/1/2013 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.	32.26	16.60	48.86
104	Cabinet Installer	29.06	15.16	44.22
105	Carpenter	29.06	15.16	44.22
106	Carpet Layer or Soft Floor Coverer	29.06	15.16	44.22
107	Cement Finisher	32.03	15.13	47.16
108	Drywall Taper or Finisher	26.10	13.65	39.75
109	Electrician Future Increase(s): Add $.50/hr on 6/1/2012. 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.	32.55	18.68	51.23
110	Elevator Constructor	43.79	25.48	69.27
111	Fence Erector	25.50	0.26	25.76
112	Fire Sprinkler Fitter	36.39	16.75	53.14
113	Glazier	36.23	11.22	47.45
114	Heat or Frost Insulator	33.28	22.51	55.79
115	Insulator (Batt or Blown)	23.62	11.55	35.17
116	Ironworker	30.90	19.11	50.01
117	Lather	29.06	15.16	44.22

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
118	Line Constructor (Electrical)	35.97	18.08	54.05
119	Marble Finisher	31.16	16.27	47.43
120	Marble Mason	32.66	16.20	48.86
121	Metal Building Erector	22.00	4.11	26.11
122	Millwright	30.66	15.21	45.87
123	Overhead Door Installer	18.00	4.86	22.86
124	Painter	25.65	14.11	39.76
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
127	Pipeline Fuser or Welder (Gas or Utility)	29.54	18.84	48.38
129	Plasterer	29.03	15.16	44.19
130	Plumber	36.20	15.02	51.22
132	Refrigeration Mechanic Future Increase(s): Add $.85/hr on 12/1/11; Add $.90/hr on 6/1/12; Add $.85/hr on 12/1/12.	40.35	16.21	56.56
133	Roofer or Waterproofer	28.06	0.00	28.06
134	Sheet Metal Worker	34.23	20.19	54.42
135	Steamfitter Future Increase(s): Add $.85/hr on 12/1/11; Add $.90/hr on 6/1/12; Add $.85/hr on 12/1/12.	40.35	16.21	56.56
137	Teledata Technician or Installer	21.26	6.99	28.25
138	Temperature Control Installer	32.55	18.68	51.23
139	Terrazzo Finisher	18.00	5.35	23.35
140	Terrazzo Mechanic	31.16	16.27	47.43
141	Tile Finisher Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80/hr on 6/1/2013.	23.77	16.00	39.77
142	Tile Setter Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80/hr on 6/1/2013.	29.71	16.00	45.71
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
146	Well Driller or Pump Installer	25.32	15.30	40.62

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
147	Siding Installer	16.74	2.58	19.32
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	32.37	16.48	48.85
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	28.78	15.16	43.94
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	17.80	9.00	26.80
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	18.00	6.98	24.98
203	Three or More Axle Future Increase(s): Add $1.57/hr on 6/1/2012.	18.00	13.83	31.83
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
205	Pavement Marking Vehicle	19.25	10.84	30.09
207	Truck Mechanic	18.00	13.68	31.68

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer Future Increase(s): Add $.50/hr. on 06/04/2012; Add $.75/hr. on 06/03/2013 Premium Increase(s): Add $1.00/hr for certified welder; Add $.25/hr for mason tender	24.14	13.45	37.59
302	Asbestos Abatement Worker	23.96	12.88	36.84
303	Landscaper	17.00	6.36	23.36
310	Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	20.39	12.20	32.59
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
SITE PREPARATION, UTILITY OR LANDSCAPING WORK ONLY

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
501	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Milling Machine; Boring Machine (Directional, Horizontal or Vertical); Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Backhoe (Track Type) Having a Mfgr's Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Crane, Shovel, Dragline, Clamshells; Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Grader or Motor Patrol; Master Mechanic; Mechanic or Welder; Robotic Tool Carrier (With or Without Attachments); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Tractor (Scraper, Dozer, Pusher, Loader); Trencher (Wheel Type or Chain Type Having Over 8 Inch Bucket). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40
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).	31.89	14.44	46.33
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/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
504	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01
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).	37.45	19.45	56.90

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
506	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	26.80	18.52	45.32
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.	27.75	19.15	46.90

HEAVY EQUIPMENT OPERATORS
EXCLUDING SITE PREPARATION, UTILITY, PAVING LANDSCAPING WORK

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
508	Boring Machine (Directional); Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.50/hr at 200 ton: Add $1.00/hr. at 300 ton; Add $1.50/hr at 400 ton; Add $2.00/hr at 500 ton.	34.62	17.98	52.60
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/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.25/hr for cranes with lifting capacity of 45 ton or over.	33.62	17.98	51.60
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/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
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; 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; Trencher (Wheel Type or Chain Type Having 8-Inch Bucket & Under); Winches & A-Frames.	35.59	19.10	54.69
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; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	29.19	17.98	47.17
514	Gas or Utility Pipeline, Except Sewer & Water (Primary Equipment). Future Increase(s): Add $2/hr. on 1/1/2013.	34.89	19.68	54.57
515	Gas or Utility Pipeline, Except Sewer & Water (Secondary Equipment).	30.32	17.40	47.72
516	Fiber Optic Cable Equipment	22.00	7.27	29.27

SEWER, WATER OR TUNNEL CONSTRUCTION

Includes those projects that primarily involve public sewer or water distribution, transmission or collection systems and related tunnel work (excluding buildings).

SKILLED TRADES

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	32.66	16.20	48.86
105	Carpenter 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.	33.43	19.31	52.74
107	Cement Finisher Future Increase(s): Add $1.86 on 6/1/12; Add $1.87 on 6/1/13; Add $1.87 on 6/1/14; 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.	30.68	15.68	46.36
109	Electrician Future Increase(s): Add $1.40/hr on 6/1/2012. Add $1.60/hr on 6/1/2013. 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.	31.54	20.95	52.49
111	Fence Erector	25.50	0.26	25.76
116	Ironworker 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.	31.31	22.22	53.53
118	Line Constructor (Electrical)	35.97	18.08	54.05
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
130	Plumber	36.20	15.02	51.22
135	Steamfitter	39.90	15.76	55.66
137	Teledata Technician or Installer	21.26	6.99	28.25

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
146	Well Driller or Pump Installer	24.22	14.80	39.02
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	32.37	16.48	48.85
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	28.78	15.16	43.94
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	17.80	9.00	26.80
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	23.00	8.64	31.64
203	Three or More Axle	21.17	9.51	30.68
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add $1.75/hr on 6/1/2012; Add $1.85/hr on 6/1/2013. 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	16.19	38.69
205	Pavement Marking Vehicle	19.25	10.84	30.09
207	Truck Mechanic	21.17	9.51	30.68

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer Future Increase(s): Add $.70/hr. on 06/04/2012; Add $.80/hr. on 06/03/2013 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.	25.28	13.44	38.72

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
303	Landscaper	17.00	6.36	23.36
304	Flagperson or Traffic Control Person	12.00	17.89	29.89
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
SEWER, WATER OR TUNNEL WORK

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.25/hr for cranes with lifting capacity of 45 ton or over.	33.62	17.98	51.60
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/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
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.	30.89	17.16	48.05
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. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	29.19	17.98	47.17
526	Boiler (Temporary Heat); Forklift; Greaser; Oiler.	29.19	17.96	47.15
527	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01
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.	36.20	18.81	55.01

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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.	26.80	18.52	45.32
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.	26.80	18.52	45.32

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	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	32.66	15.92	48.58
105	Carpenter	30.23	15.16	45.39
107	Cement Finisher Future Increase(s): Add $1.86 on 6/1/12; Add $1.87 on 6/1/13; Add $1.87 on 6/1/14; 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.	30.68	15.68	46.36
109	Electrician	37.25	14.68	51.93
111	Fence Erector	35.62	0.00	35.62
116	Ironworker	30.90	19.11	50.01
118	Line Constructor (Electrical)	35.97	18.08	54.05
124	Painter	28.00	11.15	39.15
125	Pavement Marking Operator	26.65	14.92	41.57
126	Piledriver	29.56	15.16	44.72
133	Roofer or Waterproofer	28.06	0.00	28.06
137	Teledata Technician or Installer	21.26	6.99	28.25
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.42	12.90	48.32
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	35.50	14.27	49.77
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.18	14.07	39.25
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86

154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle Future Increase(s): Add $1.75/hr on 6/1/2012; Add $1.85/hr on 6/1/2013. 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.	22.35	16.19	38.54
203	Three or More Axle Future Increase(s): Add $1.75/hr on 6/1/2012; Add $1.85/hr on 6/1/2013. 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	16.19	38.69
204	Articulated, Euclid, Dumptor, Off Road Material Hauler	24.91	15.63	40.54
205	Pavement Marking Vehicle	23.84	14.76	38.60
206	Shadow or Pilot Vehicle	24.76	15.35	40.11
207	Truck Mechanic	24.91	15.35	40.26

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer Future Increase(s): Add $1.60/hr on 6/1/2012: Add $1.70/hr on 6/1/2013; Add $1.60/hr on 6/1/2014. 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).	27.20	13.45	40.65
302	Asbestos Abatement Worker	23.96	12.88	36.84
303	Landscaper Future Increase(s): Add $1.60/hr on 6/1/12; Add $1.70/hr on 6/1/13; Add $1.60/hr on 6/1/14. 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).	27.20	13.45	40.65
304	Flagperson or Traffic Control Person Future Increase(s): Add $1.60/hr on 6/1/2012; Add $1.70/hr on 6/1/2013; Add $1.60/hr on 6/1/2014. 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 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.	23.55	13.45	37.00

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	34.22	18.90	53.12
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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	33.72	18.90	52.62

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
533	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 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); 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. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	33.22	18.90	52.12

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
534	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 Sawer (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. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	32.96	18.90	51.86
535	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. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	32.67	18.90	51.57
536	Fiber Optic Cable Equipment.	22.00	7.27	29.27
537	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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.	36.20	18.81	55.01
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.	26.80	18.52	45.32
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.	26.80	18.52	45.32

LOCAL STREET OR MISCELLANEOUS PAVING CONSTRUCTION

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	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	32.66	16.20	48.86
105	Carpenter	29.06	15.16	44.22
107	Cement Finisher Future Increase(s): Add $1.86 on 6/1/12; Add $1.87 on 6/1/13; Add $1.87 on 6/1/14; 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.	30.68	15.68	46.36
109	Electrician Future Increase(s): Add $.50/hr. effective 06/04/2012. 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.	28.74	17.86	46.60
111	Fence Erector	25.50	0.26	25.76
116	Ironworker	30.90	19.11	50.01
118	Line Constructor (Electrical)	35.97	18.08	54.05
124	Painter	25.65	14.11	39.76
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
133	Roofer or Waterproofer	28.06	0.00	28.06
137	Teledata Technician or Installer	21.26	6.99	28.25
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.42	12.90	48.32

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY 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.	29.64	14.64	44.28
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.18	13.07	38.25
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	15.00	0.00	15.00
203	Three or More Axle	19.50	4.97	24.47
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
205	Pavement Marking Vehicle	19.25	10.84	30.09
206	Shadow or Pilot Vehicle	15.00	0.00	15.00
207	Truck Mechanic	19.50	4.97	24.47

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer	26.15	12.29	38.44
303	Landscaper	23.71	15.07	38.78
304	Flagperson or Traffic Control Person	12.00	17.89	29.89
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
CONCRETE PAVEMENT OR BRIDGE WORK

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	34.22	18.90	53.12
542	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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	33.72	18.90	52.62

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
543	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. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	33.22	18.90	52.12

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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 Sawer (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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	33.22	18.90	52.12
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.	30.42	17.58	48.00
546	Fiber Optic Cable Equipment.	22.00	7.27	29.27
547	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01
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.	36.20	18.81	55.01
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.	26.80	18.52	45.32
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.	26.80	18.52	45.32

HEAVY EQUIPMENT OPERATORS
ASPHALT PAVEMENT OR OTHER WORK

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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.	34.62	17.96	52.58
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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. 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).	33.72	18.90	52.62

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14.	32.67	18.55	51.22
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 Sawer (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.	31.52	17.89	49.41
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 $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14.	32.67	18.55	51.22
556	Fiber Optic Cable Equipment.	22.00	7.27	29.27

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

CODE	TRADE OR OCCUPATION Fringe Benefits Must Be Paid On All Hours Worked	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
101	Acoustic Ceiling Tile Installer	27.00	2.47	29.47
102	Boilermaker	31.09	23.75	54.84
103	Bricklayer, Blocklayer or Stonemason	32.00	3.00	35.00
104	Cabinet Installer	22.00	2.74	24.74
105	Carpenter	27.00	3.46	30.46
106	Carpet Layer or Soft Floor Coverer	23.95	2.78	26.73
107	Cement Finisher	21.33	4.25	25.58
108	Drywall Taper or Finisher	23.80	1.55	25.35
109	Electrician	22.00	9.18	31.18
110	Elevator Constructor	43.79	25.48	69.27
111	Fence Erector	17.64	4.33	21.97
112	Fire Sprinkler Fitter	36.39	16.97	53.36
113	Glazier	36.23	11.22	47.45
114	Heat or Frost Insulator	29.04	19.73	48.77
115	Insulator (Batt or Blown)	18.95	1.70	20.65
116	Ironworker	30.90	19.11	50.01
117	Lather	28.15	15.14	43.29
119	Marble Finisher	31.16	16.27	47.43
120	Marble Mason	32.66	16.20	48.86
121	Metal Building Erector	17.50	2.80	20.30
123	Overhead Door Installer	17.00	0.00	17.00
124	Painter	25.65	6.33	31.98
125	Pavement Marking Operator	26.00	0.00	26.00

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
129	Plasterer	19.00	0.29	19.29
130	Plumber	30.00	10.34	40.34
132	Refrigeration Mechanic	30.96	0.00	30.96
133	Roofer or Waterproofer	29.85	1.55	31.40
134	Sheet Metal Worker	21.03	3.40	24.43
135	Steamfitter	32.59	11.05	43.64
137	Teledata Technician or Installer	19.23	5.32	24.55
138	Temperature Control Installer	22.45	4.11	26.56
139	Terrazzo Finisher	18.00	5.35	23.35
140	Terrazzo Mechanic	31.16	16.27	47.43
141	Tile Finisher	23.96	13.36	37.32
142	Tile Setter	21.00	0.00	21.00
143	Tuckpointer, Caulker or Cleaner	23.96	12.88	36.84
146	Well Driller or Pump Installer	15.10	12.38	27.48
147	Siding Installer	18.80	1.42	20.22

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	19.86	2.54	22.40
203	Three or More Axle	19.50	14.27	33.77
205	Pavement Marking Vehicle	19.25	10.84	30.09
207	Truck Mechanic	19.00	1.75	20.75

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer	16.09	7.18	23.27
302	Asbestos Abatement Worker	17.00	2.21	19.21
303	Landscaper	25.00	0.54	25.54

311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51

HEAVY EQUIPMENT OPERATORS
RESIDENTIAL OR AGRICULTURAL CONSTRUCTION

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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, Timbco, 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.	29.45	15.37	44.82
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.	26.45	14.35	40.80

********** END OF RATES **********